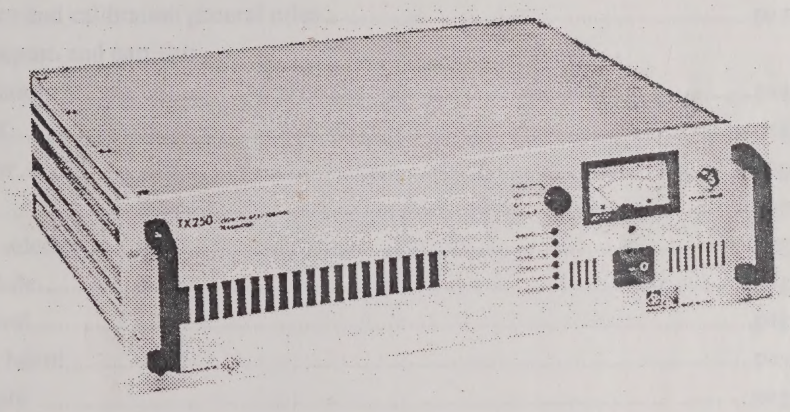
TX250 250W TRANSMITTER 87.5 ÷ 108 MHz

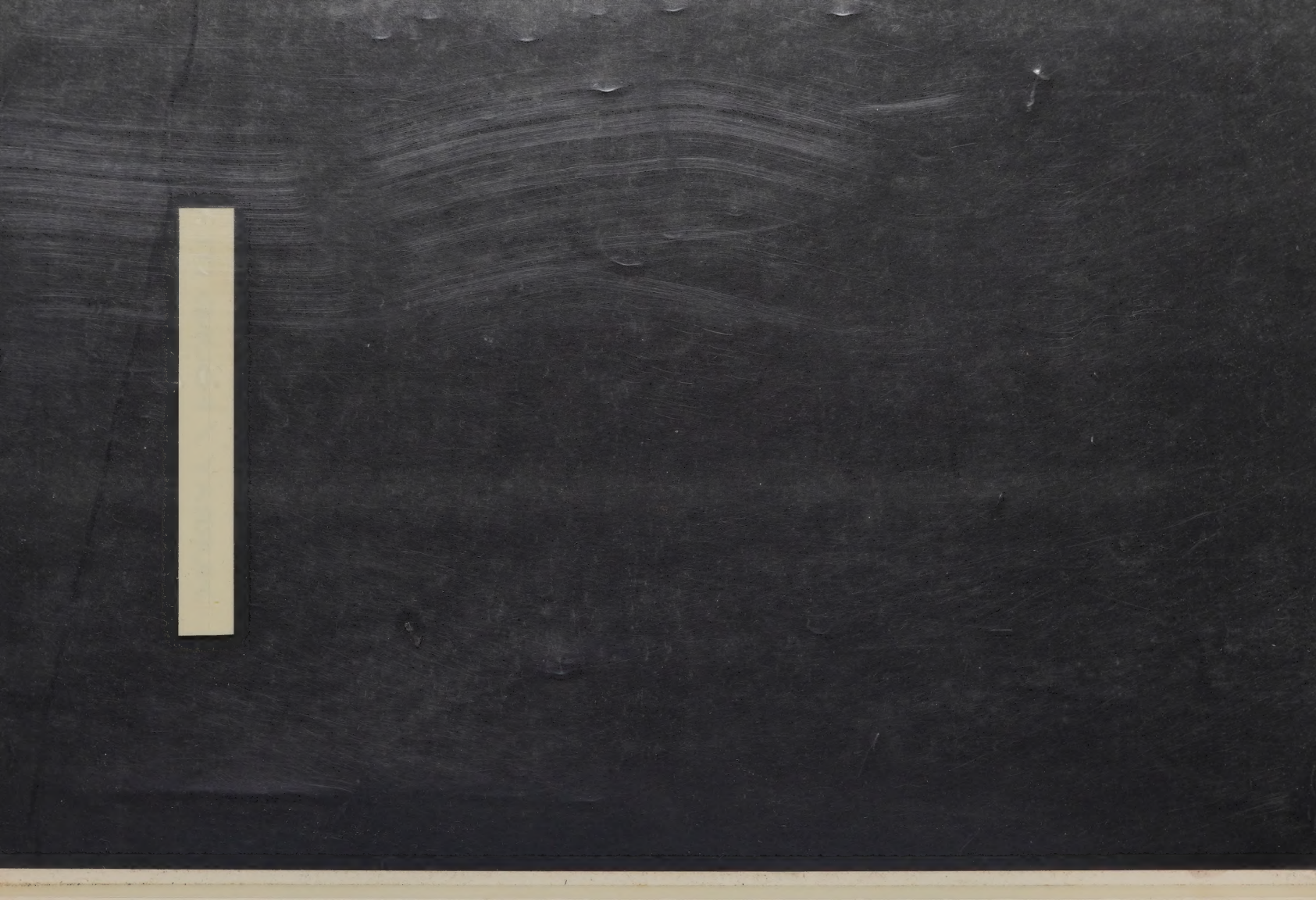


TECHNICAL AND MAINTENANCE MANUAL

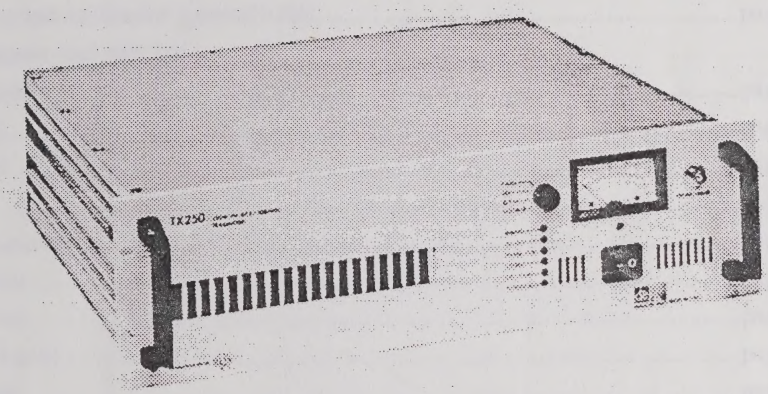
MURRAY / FOUND IT!

INTERNATIONAL
BROADCASTING DIVISION®

manufactured by META SYSTEM - Italy



TX250 250W TRANSMITTER 87.5 ÷ 108 MHz



TECHNICAL AND MAINTENANCE MANUAL

BROADCASTING DIVISION ®

manufactured by META SYSTEM - Italy

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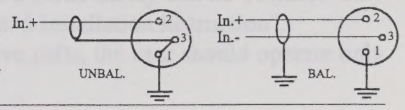
TX 250 - 250W TRANSMITTER TECHNICAL DATA

Frequency	Range			87,5+108MHz or 66+74MHz
	Set			Internal digitally programmable in 10KHz steps
	Fine frequency Adjustement			Internal trimmer capacitor
	Stability			Better than 5 ppm after 20" from turning on
Input data	L.F.connectors			Audio canon for left and right input - Audio canon for mono/Mpx
	Left	Impedance	600/10 KΩ bal or unbal.	CANON XLR, female
		Level	from -12 to+9dBm	
	Right	Impedance	600/10 KΩ bal or unbal.	CANON XLR, female
		Level	from -12 to+9dBm	
	Mono/Mpx	Impedance	600/10 KΩ bal or unbal	2 x CANON XLR, female: Mono and Mpx input
		Level	from -12 to +9dBm	
	Scal	Impedance	10 KΩ unbal.	BNC connector
		Level	0dBm	
Output data	Mpx output			(Stereo version) BNC connector, 0dBm, for additional transmitter
	R.F. Probe			BNC connector - R.F. power control (-60dBc)
R.F.Power	R.F.connectors			Type N for R.F. output - type BNC for R.F.monitor (-60dBc)
	Impedance			50 Ω
	Output power			Minimum 200W typical 250W [Ext.adjustable from 40W to maximum pwr.(ALC)]
R.F.output specification	Spurious and Harmonicssuppression			-60dB (typical -70dBc)
Probe	R.F.			-60dBc
S/N RATIO	Mono (referred to ±75KHz)	Weighted CCIR 468/2		minimum -60dB(typical-65dB)
				minimum -60dB(typical-65dB)
		Unweighted		minimum -60dB(typical-65dB)
				minimum -60dB(typical-65dB)
	Internal stereo (referred to ±75KHz)	Weighted CCIR 468/2		minimum -60dB(typical-65dB)
		Unweighted		minimum -60dB(typical-65dB)
	External stereo (mpx) (referred to ±75KHz)	Weighted CCIR 468/2		minimum -60dB(typical-65dB)
		Unweighted		minimum -60dB(typical-65dB)
THD ΔF= ±75KHz	Mono			0,15% (with de-emphasis)
				0,2% (no de-emphasis)
	Internal stereo			0,4% (L,R with de-emphasis)
				0,5% (L,R no de-emphasis)
	External stereo (mpx)			0,5% (L,R with de-emphasis)
				0,5% (L,R no de-emphasis)
Stereo specification	Internal stereo		Separation	minimum 40dB (L,R 30Hz to 15KHz)typical 45dB
	External stereo (mpx)		Separation	minimum 40dB (L,R 30Hz to 15KHz)typical 45dB
Design data	Modules			-Impedance Translator Calibration Board -Pre-emphasis Filter (only Mono/MPX version) -Stereo Coder Module(only Stereo Coder version) -PLL Modulator (1W o.p.) -Power Amplifier (1 x BLY93 + 2 x BLV25) + Low Pass Filter + Directional Coupler -Power Supply (27V / 15A - 22V / 1A) not stabilized, with filter Impedance -Panel Back Board
	External Controls			-Mains Switch -External Output Power Adjustement -Mono/Stereo Switch
	Modulation		type	F3 direct carrier frequency modulation
			capability	Meets or exceeds all FCC and CCIR requirements
	Type			-Solid state direct fm frequency - quartz locked digital synthesizer -Coder - According to CCIR 450-2
	Meter			-Forward power: 400W f.s. with log. scale -Reflected power: 40W f.s. with log. scale -Peak modulation: 100KHz f.s.with linear scale -DC voltage 50V f.s. with linear scale
	Monitoring			-Mains -Stereo "ON" -Phase lock -Excessive VSWR -Overheating
	Protections			-Overheating -Excessive VSWR
	Options			
Temperature	Ambient range			0°to 40°C (operational -20° to +45°C)
	Storage range			-40° to +60°C
AC power requirement				110, 220 V or 240V ±5% 50-60Hz, single phase - consumption approx.450W from AC
Dimensions and weight				123H x 448W x 440D mm,approx. 22,5 Kg - front panel 483 mm (19") W x 132 mm (5,2") H
Cooling				Forced air cooling: 1 Blower 220V AC - 120x120 mm.



All designs and specifications of the equipment are subject to change without notice.

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https://archive.org/details/tx250250wtransmi00unse

OPERATOR SAFETY

The transmitter TX250 is realized respecting the safety rules: a better safety can be obtained only by correctly applying the principles of the section "Operation and Installation instruction".
Similarly, for maintenance and localization of possible defective parts, the user should operate only on some parts.

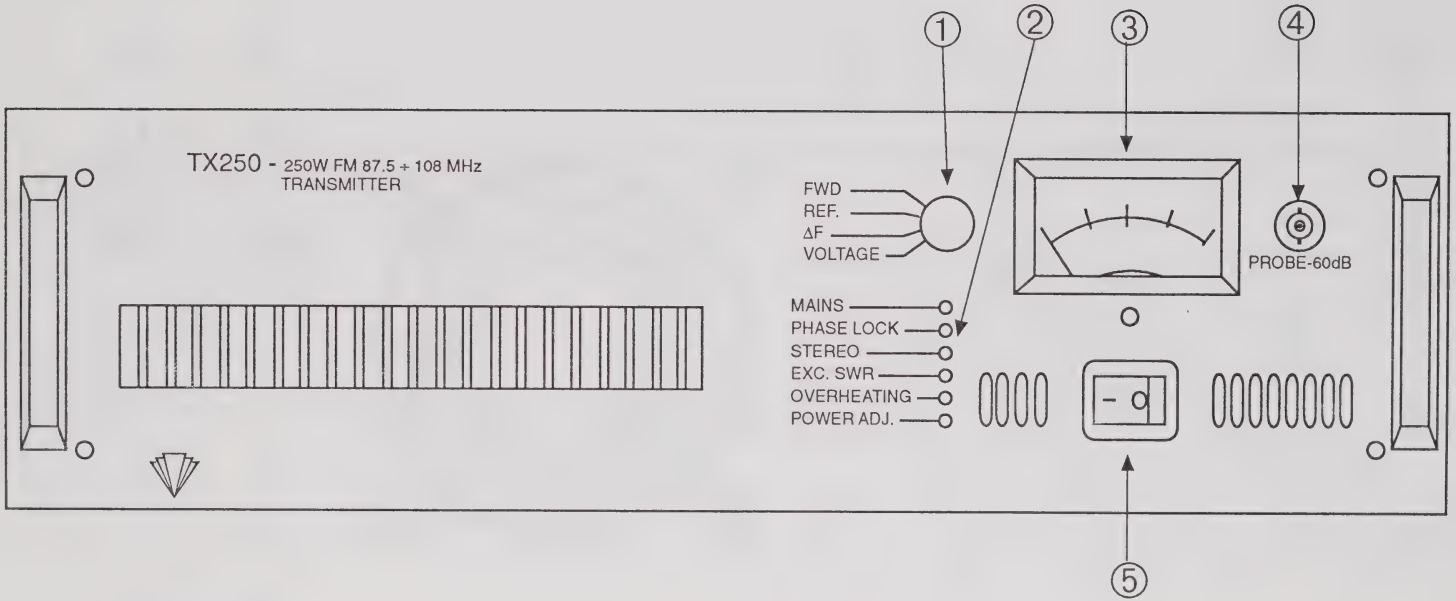
CTE is not responsable for damages to people or things occurred if these modalities are not carefully applied.

WARRANTY

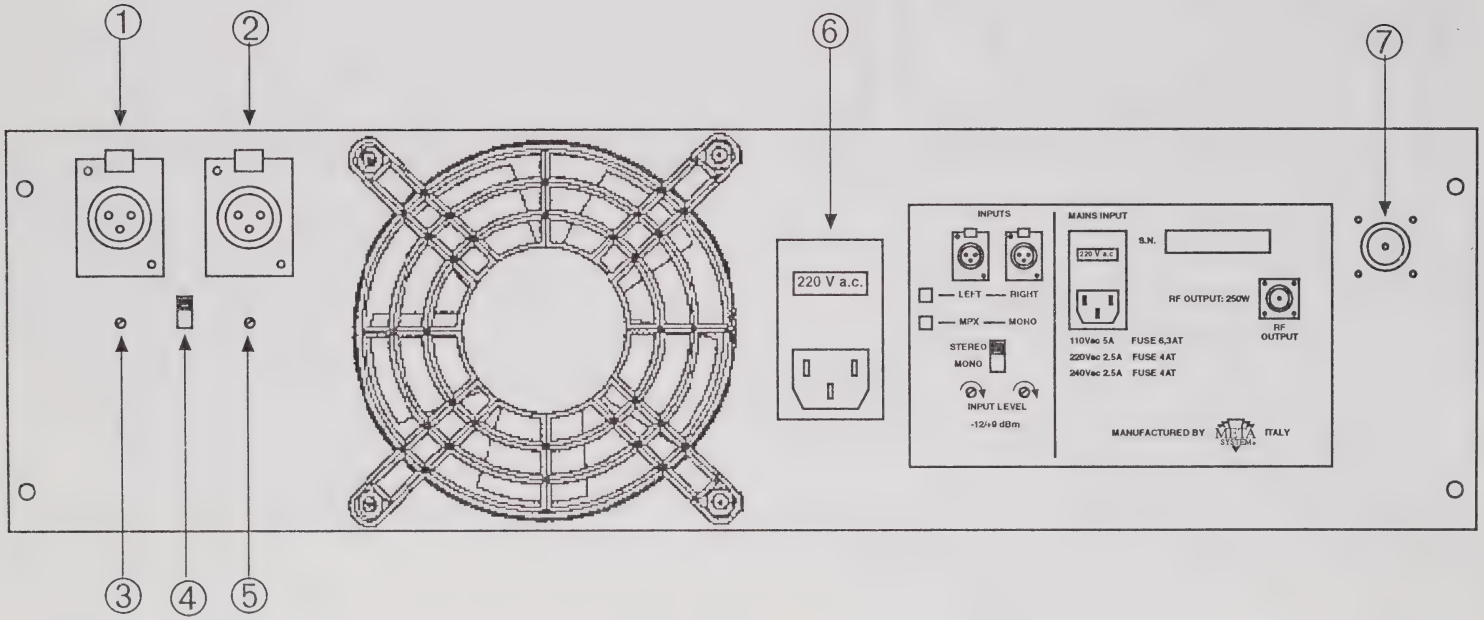
This equipment is sold with a twelve month warranty from the date of the purchase, against any material or manufacturing defect; the labour and the faulty components are at our charge only if the equipment arrives to us duty-free, intact and at our factory or one of the authorized centers, before twelve months from the purchase's date.

The warranty is not valid if the equipment has been object of improper use, accidents, tampering or used differently as recommended in the instructions.
Any other warranty form, explicit or implicit is not appliable, just the points stated before are the only valid warranty form.

FRONT VIEW


TX250 - 250W FM 87.5 ÷ 108 MHz
TRANSMITTER
FWD
REF.
ΔF
VOLTAGE
MAINS
PHASE LOCK
STEREO
EXC. SWR
OVERHEATING
POWER ADJ.
PROBE-60dB
1
2
3
4
5

REAR VIEW


1
2
6
7
3
4
5
220 V a.c.
INPUTS
LEFT
RIGHT
MPX
MONO
STEREO
MONO
INPUT LEVEL
-12/+9 dBm
MAINS INPUT
220 V a.c.
S.N.
RF OUTPUT: 250W
RF
OUTPUT
110Vac 5A FUSE 6,3AT
220Vac 2,5A FUSE 4AT
240Vac 2,5A FUSE 4AT
MANUFACTURED BY
ITALY

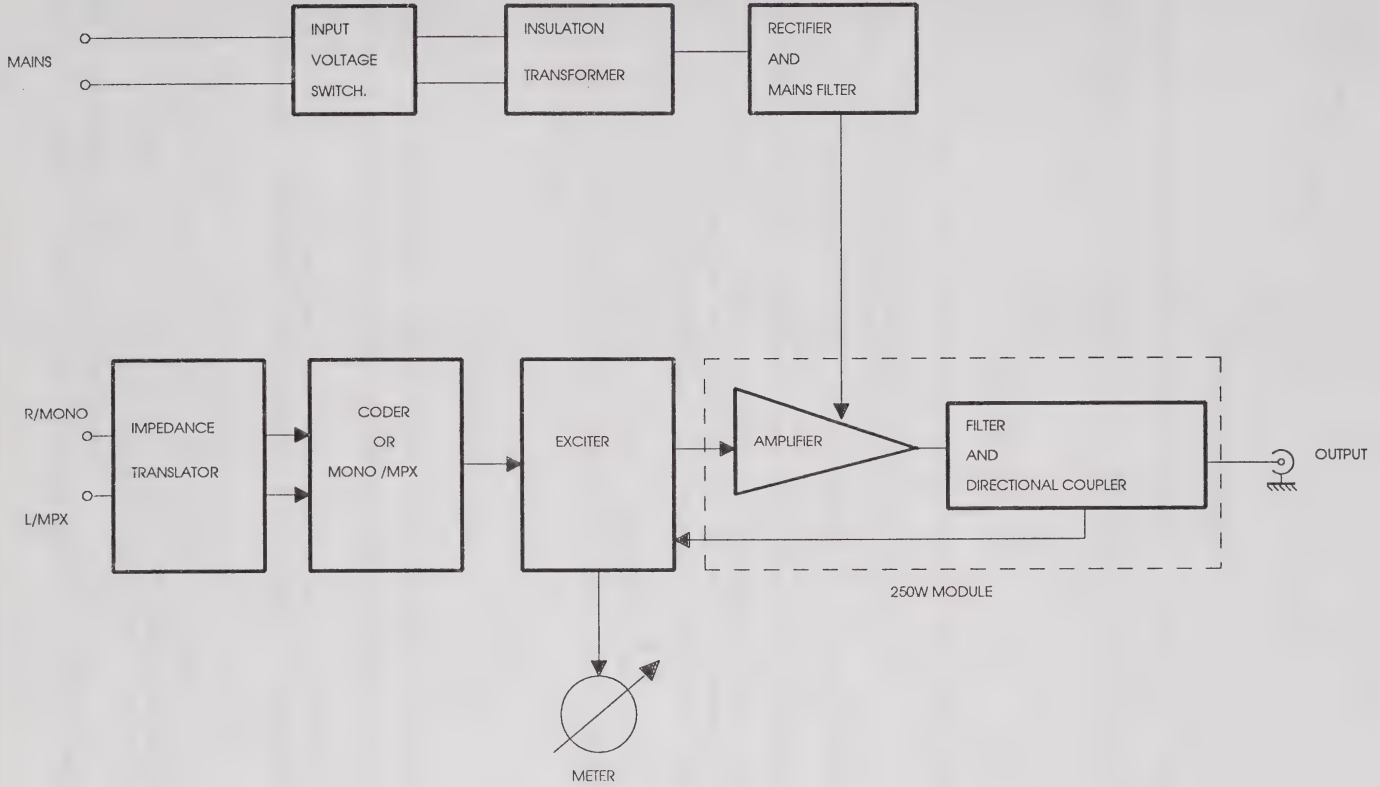
FRONT VIEW

1) Functionswitch for the reading instrument
2) LED indicators
3) Reading instrument
4) -60dBc probe
5) Power switch

REAR VIEW

1) L (MPX) input
2) R (MONO) input
3) L (MPX) input level regolator
4) MONO/STEREO switch
5) R (MONO) input level regolator
6) Mains input - fuse - voltage selector
7) Output connector

BLOCK DIAGRAM



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DESCRIPTION

The transmitter TX250 is composed of the following blocks:
- Power supply
- Exciter
- Power stage
- Impedance translator
- Stereo coder or mono MPX

POWER SUPPLY

The power supply is the non-stabilized type with a high capacity filter and fuse protection located on the internal printed circuit.

EXCITER

The exciter of TX250 is a P.L.L. sinthetizer provided with 10KHz steps.
It can therefore cover the entire FM band from 87.5 to 108 MHz.
The oscillator is in fundamental frequency thus to minimize the emission of spurious frequencies, generally caused by the multiplying or mixing stage of the Radio Frequency.
The exciter stage contains also an automatic control of the power delivered which having as input two voltages proportional to the direct and reflected power, originated from a directional coupler located in the power stage, provides variation of the output power of the exciter in a way to rule the P. out 20 - 250 W for any output frequency and at the variation of the mains voltage between the consented limits by the technical features.
In case the report of stationary waves is excessively high, the circuit lower automatically the driving of the power stage, achieving this way a total protection in case of the antenna damage or its connection line damage.

POWER STAGE

This power stage provided a nominal power of 250W throughout the range 87.5÷108 MHz with an input power of 1 W.
The circuit has been wholly developed with "Microstrip" technology and ferrite transformers to obtain the maximum reproducibility, band width and invariability of caracteristics through the times.
The circuit does not require any adjusting because of the wide band technology employed in its construction. In the power stage output there is a low-pass filter composed by a four cell in constnt K, then being a configuration able to warrant a harmonics respons attenuation greater than 60 dB.
Inside the metal box of the filter there is also a circuit attenuating the RF output signal fill -60dBc, this signal is then sent to the BNC on the front panel.
This signal makes it possible to monitor the output signal in the 87.5÷108 MHz range.

IMPEDANCE TRANSLATOR

This circuit placed on the rear panel of TX250, allows having audio frequency inputs - balanced or not - on a typical impedance of 600 Ω or 10 KΩ by removing an internal jumper.
The input level can be adjusted in the range -12 ÷ +9 dBm (ajdustable with the two trimmers reachable from the outside).

STEREO CODER OR MONO MPX

The stereo coder of TX250 is manufactured with selected components that afford truly HI FI characteristics.
The 19 KHz subcarrier is crystal controlled in compliance with the CCIR rules for High Fidelity.
The coder has a preemphasis network of 50 μs which fully meets the European standards.
The TX250 is supplied in MONO/MPX version with a preemphasis module of 50 μs.
The two modules are interchangeable.

1) The power voltage for use is set at shipping, according to the specification when the order was received. If mains voltage was not specified in the order, it is standard the 220 Vac mode. To change the standard mains voltage to another, for example 110Vac. Remove the cover of fuseholder on the rear panel and commute the switch on the 110 Vac position. Replace the fuse with one of an appropriate value.
2) Place the transmitter in a ventilated room free from dust.
   DO NOT OBSTRUCT THE VENTILATION HOLES OF THE TRANSMITTER
3) Connect the antenna and make sure the connection between transmitter and antenna is correct.
4) Set controls as follows:
   a - Verify if the power switch is turned off.
   b - Select the trasmission frequency through the internal bit-switch (see chapter "Selection of output frequency").
   Note: make sure the antenna operating frequency matches the preselected frequency.
   c - Set the selector switch on position FWD.
5) Plug in the power cord in the mains electric outlet.
   IF THE MAINS VOLTAGE SUFFER VARIATION OVER ± 5% IT IS NECESSARY TO INSTALL AN ELECTRONIC STABILIZER.
6) Turn on the equipment switch and wait a few seconds until it warms up ("PHASE LOCK" LED). The meter will show the output power .
7) Set the selector switch on position REF. At this time you may read directly on the meter the reflected power.

The eventual lighting up of the led "excessive SWR", indicates the reflected power from the antenna is too high; verify in this case if the applicated antenna is adequate to work on the selected frequency, or that there are not bad connections on the downcoming cable.

Note: The indication given by the meter is real, only if antenna impedance is 50 Ω, this because the unit is set on a 50 Ω dummy load. If the antenna impedance is different, the output power given by the meter will be higher or lower than the power actually delivered.
If everything is all right , plug in the connectors of the AF signal .

At this time, the checks and activation of the transmitter are done and your unit is ready to start transmitting.

The transmitter requires no maintenance. Just check periodically that the stationary wave stays within acceptable limits.

Note: In case of frequency change, make sure the new transmitting frequency falls within the antenna operating range.

For audio frequency connections use first quality shielded cable to prevent radio frequencies from being feed back into the audio system.

OUTPUT FREQUENCY SELECTION

Operate the frequency selectors only with the unit turned off.
The transmission frequency varies within the range 87.5÷108 MHz 10 KHz step through the 16 bit-switches inside the exciter unit, and reachable by the window of the case itself.

1) Turn the unit off and disconnect the power cord from the mains.
2) Unscrew the eight screws that fixed the upper cover.
3) Remove the top of the cover of the exciter unit allowing this way the acces to the bit-switches for the selection of the frequency.
4) Set through the last four switches the ten of MHz remarking that the contribution of the single switches set in position ON make an addition; for example, to set 8 you must put in the ON position the switch marked on the printed as 8; to set 9 you must put in position ON the two switches marked on the printed as 8 and 1; to set 10 you must put in position ON the two switches marked as 8 and 2.
5) Set the MHz units through the four switches located under "MHz" mark, always remarking that we add the contribution of the single switches, so to set 7 you must put in position ON the three switches marked on the printer circuit as number 1, 2 and 4.
6) Following the steps of point 5, set the hundred of KHz through the four switches located under the mark "KHz x 100" and the ten of KHz though the switches located under the mark "KHz x 10".
7) Close the case up, connect the antenna and turn on the unit; after a few seconds the LED that indicates the phase lock will be lit up and the transmitter will deliver power on the selected frequency.

SIGNAL OF ANOMALOUS OPERATION

The TX250 transmitter has two luminous anomalous operation signals.

EXCESSIVE SWR LED ON THE FRONT PANEL COMING ON

This LED comes on when the aerial circuit or the downward line fails; check the power reflected by the aerial system by turning the switch (1) to the REF position. If the value read is close to 25W you need to turn off the equipment and check cable, connections and aerial.

OVERHEATING LED COMING ON

This LED comes on when the temperature is too high, and also does the output power down. This protection remains active till the internal temperature drops within normal working limits. Overheating may be due to bad air circulation capabilities.

GENERAL INFORMATIONS ON INTERFERENCES WITH OTHER RADIO-TV SERVICES

The possibility that spurius emission of our equipment might interfere with other radio and television system is pratically inexistent for the simple reason that a spurious response attenuation of 70 dB means that this kind of interference is attenuated of 10 millions times with respect to the fundamental frequency;
For example: an output power of 250Watts at 100MHz with a spurious response attenuation of 70dB means that the spurious signals are at a level of 25 μW which actually amounts to 0.000025 Watts.

However, sometimes causes of interferences may arise and althought they are not caused by the transmitter they can nevertheless be rather troublesome. Here are the most common cases and the possible remedies:

1) INTERMODULATION IN WIDE-BAND RECEVING SYSTEMS

If near a transmitting antenna there are wide-band TV receving systems, we might have problems of saturation and intermodulation of those systems.

Let us try understand this sort of inconvenience:
suppose the antenna transmits a signal at 100MHz. The system will receive the various TV signals as well as the radio signals transmitted by our antenna (the passband of a station of this type usually being 50 ÷ 900 MHz).

If the TV system receives a very strong signal at 100MHz, it will amplify it by its gain factor and quite probably reach the saturation of its amplification stages. When an amplification stage tends to get saturated, it starts squaring the signals and, since the square wave is richest in harmonics, almost certainly one of those harmonics will fall on a TV channel and causes disturbances.

In this case we would recommend:
to place the two antennas farther apart from one another till the Tv receving system is no longer in saturation, or to install on the receiver input a filter which would cut off the FM band.

2) INTERFERENCES CAUSED BY IMAGE FREQUENCY

Public-safety and defense communications services quite frequently complain about interferences. The fact is that these are caused not by the transmitter but by the poor image frequency rejection of the receiver used for those services. For example, if we transmit on 100MHz, we could get complaints from airport and port operation services operating on the frequency of 121.400MHz because their receivers, supposing they have an intermediate frequency at 10.700MHz, will have the local oscillator at 110.700MHz

(121.400-10.700=110.700MHz)

And, if the receiver instead of making a frequency addition (intermediate frequency plus local oscillator) makes also a subtraction (poor image frequency rejection), the receiver will also pick up the signals at 100MHz

(110.700-10.700=100.000MHz).

In this case, the only solution to the problem would be that of placing a filter at the input of the receiving system to drastically cut off the FM band of 88 ÷ 108 MHz.

NOTE: It is however advisable not to install such a powerful amplifier in city areas within 100 ÷ 200 meters from TV or other service receiving system. Moreover, a good separation should be provided between radio frequency system and audio frequency system to prevent radio frequencies from being fed back into the mixer line amplifiers, etc.

Maintanence and repairment should be done by qualified personal only.

NECESSARY INSTRUMENTS

For a complete calibration or repair of the transmitter we suggest for following instruments:

- Spectrum analyzer 0.1 ÷ 1000 MHz
- 20 MHz oscilloscope
- 225 MHz frequency counter
- Audio frequency generator
- Digital multimeter
- Modulation meter
- Stereo decoder or stereo receiver
- 2 wattmeters
- π impedance converter
- 50 Ohm dummy load
- 2W 20dB 50Ω RF attenuator

POWER SUPPLY CALIBRATION

The power supply does not require any calibration. The only thing to do is to check that the two output voltage values are as follows:
a) 27V ±5% power stage supply.
b) 22V ±5% exciter supply.

EXCITER CALIBRATION

Supply the exciter unit with 22V and check if the internal stabilizer gives to its output (Q9 emitter), a voltage of 12V.
At this time check the oscillator excursion that must operate from 84 ÷ 110 MHz approx. If this condition was not achieved, act on the L(3) coil spacing to obtain the frequency range above mentioned.
Connect the RF output of the exciter to the 20 dB attuenuator and then to the frequency meter; set a frequency between 87.5 ÷ 108 MHz with the relatives dip-switches and turn the variable capacitor CV2 to obtein exactly the selected frequency. Next step is to calibrate the modulation section.
Set the frequency to 98 MHz. Connect the audio generator to the AF input and the modulation meter to the attenuated RF output, within this condition adjust the AF signal amplitude to 6 Vpp and its frequency to 15 KHz. Adjust then RV1 to obtain a deviation of ± 75 KHz.
In order to make constant the deviation in the whole band (87.5 ÷108 MHz) and its frequency, act on the CV1 observing the following procedure:
Check that the deviation is ±75 KHz, then switch from 87.5 MHz to 108 MHz if necessary adjust then the CV1 so that at the extremes of 87.5 ÷ 108 MHz the deviation is constant.
The remaining calibration are to do on the trimmers RV2 and RV3, adjusting the direct power and the protection against reflected power respectivly.
The above mentioned calibration will be done when the exciter unit is mounted inside the equipment.

MONO / MPX CALIBRATION

Feed the circuit at 22 V.
The operations that needs to be done concerns the output level of the MPX and mono inputs. Generate an AF signal at 40Hz and amplitude 0 dBm (~2,2 Vpp), and connect it first to the MPX input. Adjust then RV4 to obtain a 6 Vpp amplitude signal which is necessary in order to deviate ±75 KHz. Do the same acting on the RV3 for the mono input.

STEREO CODER CALIBRATION

Feed the circuit at 22 V and set for MONO operation. The first regualtion to do concerns the output level.
A 40 Hz, 0 dBm (2.2 Vpp) signal is delivered to the R input and with RV3 the MPX output should be adjusted to 3 Vpp. The same procedure is executed from the L channel through RV4.
At this time verify that delivering the signal to both channels, the MPX output is 6 Vpp. The next step concerns the regulation of the 19 KHz pilot tone. Without any input signal and the stereo operation selected, set RV2 in a way that the pilot tone of MPX output will be 0,5 Vpp.
Last adjustment to be performed is the stereofonic separation acting on RV1. You can employ either a decoder or a good quality stereo receiver. The condition to observe is a better separation than 45 dB with a 1 KHz frequency signal.

POWER STAGE CALIBRATION

The power stage does not require any calibration.
In fact, the adopted technology does not require any adjustment of the circuits with variable components.
The only two necessary operation are: the output power must be the one declared for the entire band and check with the spectrum analyzer that no oscillations occur. The only variable component is CV2. This one zeros the output of the reflected wave detector when the output is connected to 50 Ω resistive load.

IMPEDANCE TRANSLATOR CALIBRATION

Feed the circuit with 22 V.
Connect an AF generator at the R (MONO) input with a frequency signal variable within 20 Hz and 100 KHz, amplitude 0 dBm (2.2 Vpp).
Adjust RV2 in order to obtain the same output level as the input signal. When connected to the L (MPX) input act on RV1 in the same way as decribed before.

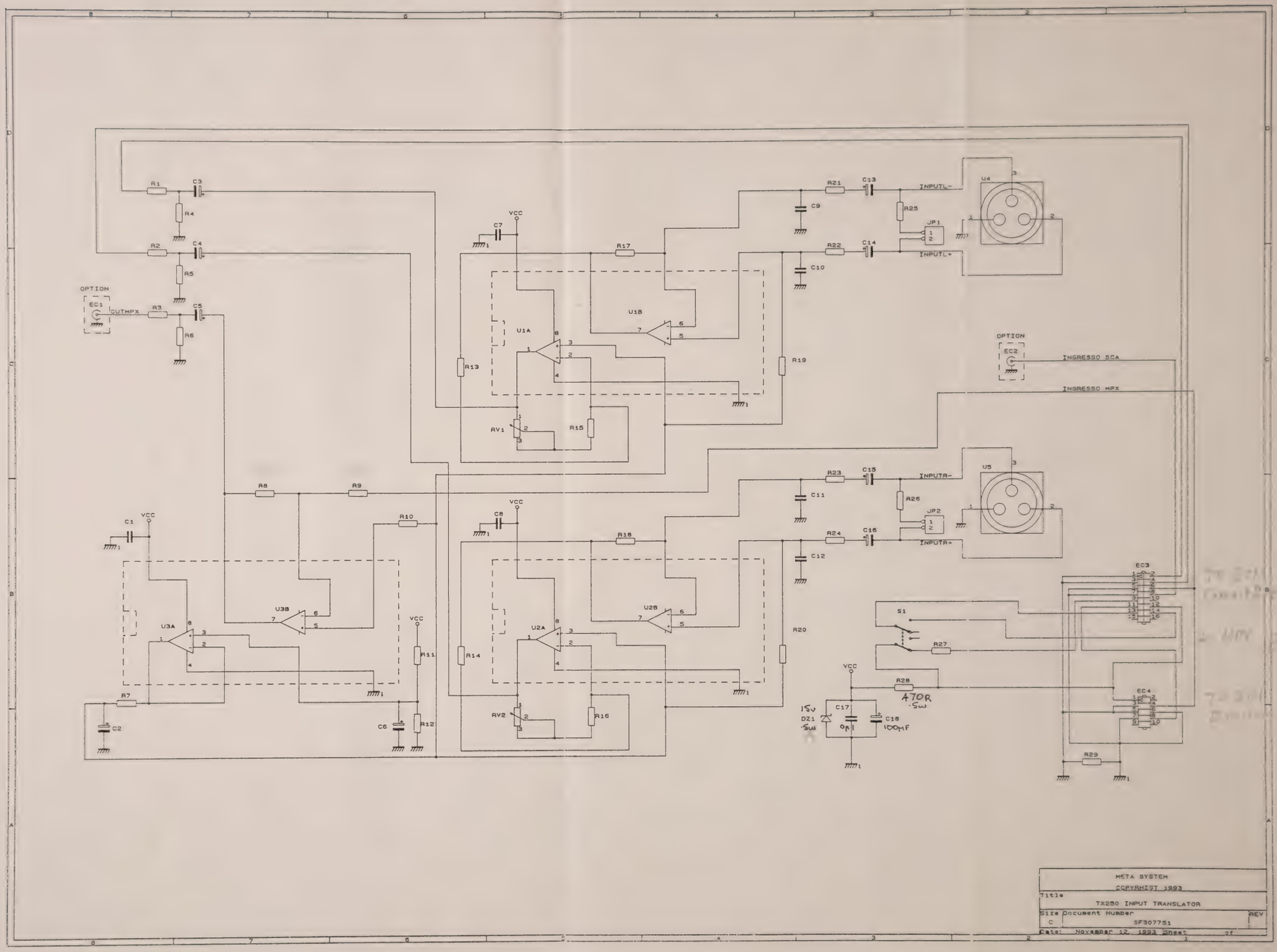
COMPLETE TRANSMITTER CALIBRATION

Connect the transmitter output to a 50 ohms dummy load, capable to stand the power delivered.
Interpose in the line two wattmeters and the impedance converter; the wattmeter will have as full scale 250W to measure the direct power wnd 50W to the reflect power.
This procedure is to be performed with the load perfectly adapted.
At this time the first calibration to do is the one concerning the output power. Rotate the trimmer power adjustment on the front panel completely clockwise to have the maximum power in output; adjust the trimmer RV2 located inside the exciter to obtain a power output of 200W.
Then check that performing on P. out trimmer, the power varies from the minimum to the maximum fixed before.
Now, we proceed with the regulation of the protection against the high reflected power.
Make the transmitter deliver the nominal power and through the impedance converter create a situation in which the SWR is 2 approx. In this situation, adjust the trimmer RV3 located inside the exciter, for the intervention of the protection marked by the red LED lit up on the front panel (marked "excessive SWR").
Subsequently we proceed with the modulation level control, for the STEREO version set the stereo/mono switch in mono position . Deliver a signal of 40Hz and 0 dBm to both AF inputs, then through the modulation meter, check that the deviation is ± 75KHz. If this condition is not fullfilled, adjust the trimmer RV1 inside the exciter until reach the requested deviation.
For the mono/MPX version connect the 40Hz signal to one of the mono or MPX input, and act as described before

Panel Back Board calibration

The calibration of this control board demands four regolation in all.
1) Adjust "direct power" reading on the instrument by means of RV1.
2) Adjust "reflected power" reading on the instruments by means of RV2.
3) Adjust ΔF reading on the instrument by means RV3.
4) Adjust power supply voltage reading (≈ 27V) on the instrument by means RV4.

At this point all the calibration are carried out. To complete the equipment control it is possible to effect some measure regarding the harmonics attenuation and the residual AM by means of a spectrum analyzer and a modulation meter respectively.


OPTION
EC1
OUTMPX
R1
R2
R3
R4
R5
R6
C3
C4
C5
VCC
C7
R17
U1A
U1B
R13
R19
AV1
R15
R21
R22
C9
C10
C13
C14
INPUTL-
INPUTL+
R25
JP1
U4
OPTION
EC2
INGRESSO SCA
INGRESSO MPX
R8
R9
R10
C1
C8
R18
U3A
U3B
U2A
U2B
R14
R20
AV2
R16
R11
R12
C6
C2
R7
R23
R24
C11
C12
C15
C16
INPUTA-
INPUTA+
R26
JP2
U5
EC3
EC4
S1
R27
R28
470R
.5W
VCC
15V
DZ1
.5W
C17
0R1
C18
100nF
R29
META SYSTEM
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Date: November 12, 1993
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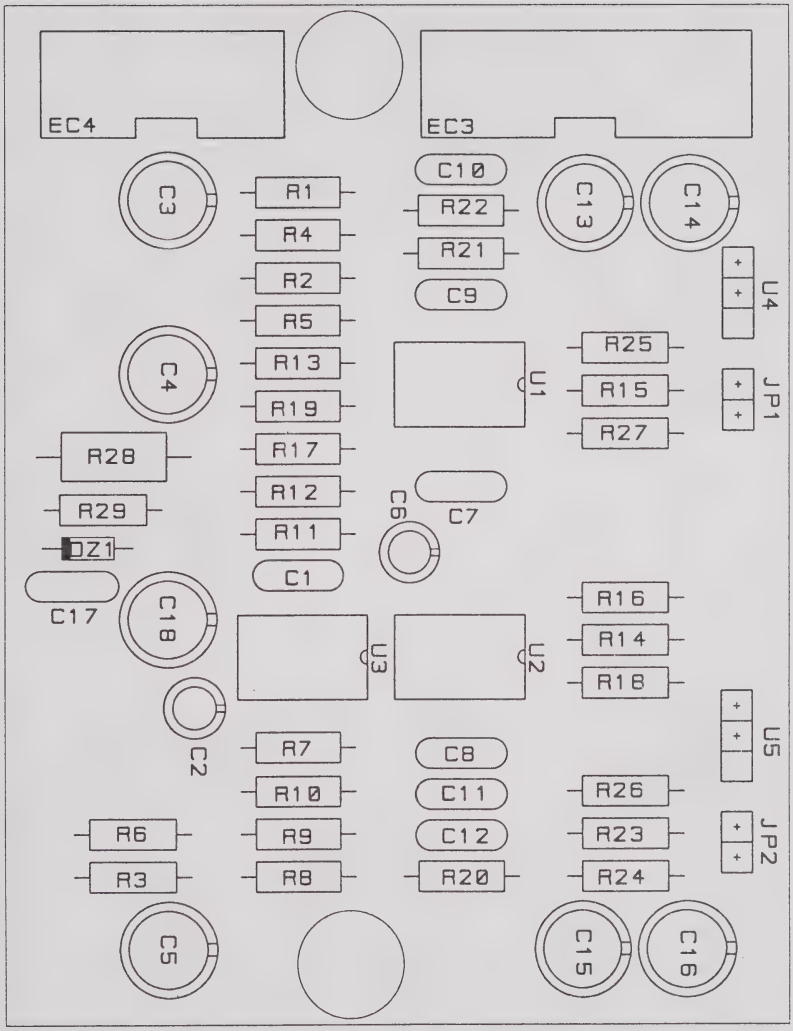
EC4
EC3
C3
C4
C5
C2
C17
C18
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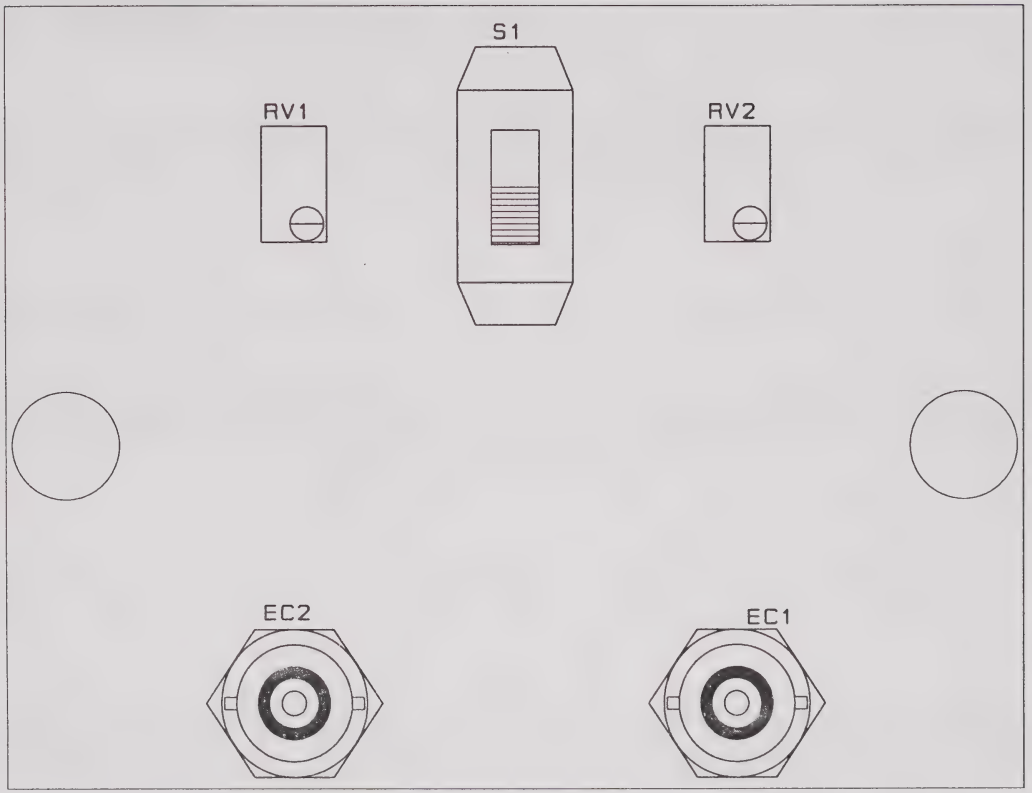
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RV2
EC2
EC1

TX250 INPUT TRANSLATOR

cod. SF3077

Part List

Item	Ref.	Description	Part Number
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2	C2	10µ	C2210J
3	C3	100µ	C2310D
4	C4	100µ	C2310D
5	C5	100µ	C2310D
6	C6	10µ	C2210J
7	C7	0µ1	C01764
8	C8	0µ1	C01764
9	C9	100p	C01632
10	C10	100p	C01632
11	C11	100p	C01632
12	C12	100p	C01632
13	C13	100µ	C2310D
14	C14	100µ	C2310D
15	C15	100µ	C2310D
16	C16	100µ	C2310D
17	C17	0µ1	C01764
18	C18	100µ	C2310D
19	DZ1	15V 1/2W	D00140
20	EC1	BNC	E04541
21	EC2	BNC	E04541
22	EC3	POL16	E05602
23	EC4	POL10	E05600
24	JP1	POLISTRIP	E04300
25	JP2	POLISTRIP	E04300
26	RV1	50K	R05222
27	RV2	50K	R05222
28	R1	560	R00331
29	R2	560	R00331
30	R3	560	R00331
31	R4	10K	R00481
32	R5	10K	R00481
33	R6	10K	R00481
34	R7	100	R00241
35	R8	4K42	R01250
36	R9	12K1	R01334
37	R10	10K	R01318
38	R11	10K	R01318
39	R12	10K	R01318
40	R13	12K1	R01334
41	R14	12K1	R01334
42	R15	4K22	R01246
43	R16	4K22	R01246

Item	Ref.	Description	Part Number
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45	R18	10K	R01318
46	R19	10K	R01318
47	R20	10K	R01318
48	R21	10K	R01318
49	R22	10K	R01318
50	R23	10K	R01318
51	R24	10K	R01318
52	R25	680	R00341
53	R26	680	R00341
54	R27	1K5	R00381
55	R28	470 1/2W	R00322
56	R29	10	R00121
57	S1	DEV2V2P	E01043
58	U1A	TL072	I00308
59	U1B	TL072	I00308
60	U2A	TL072	I00308
61	U2B	TL072	I00308
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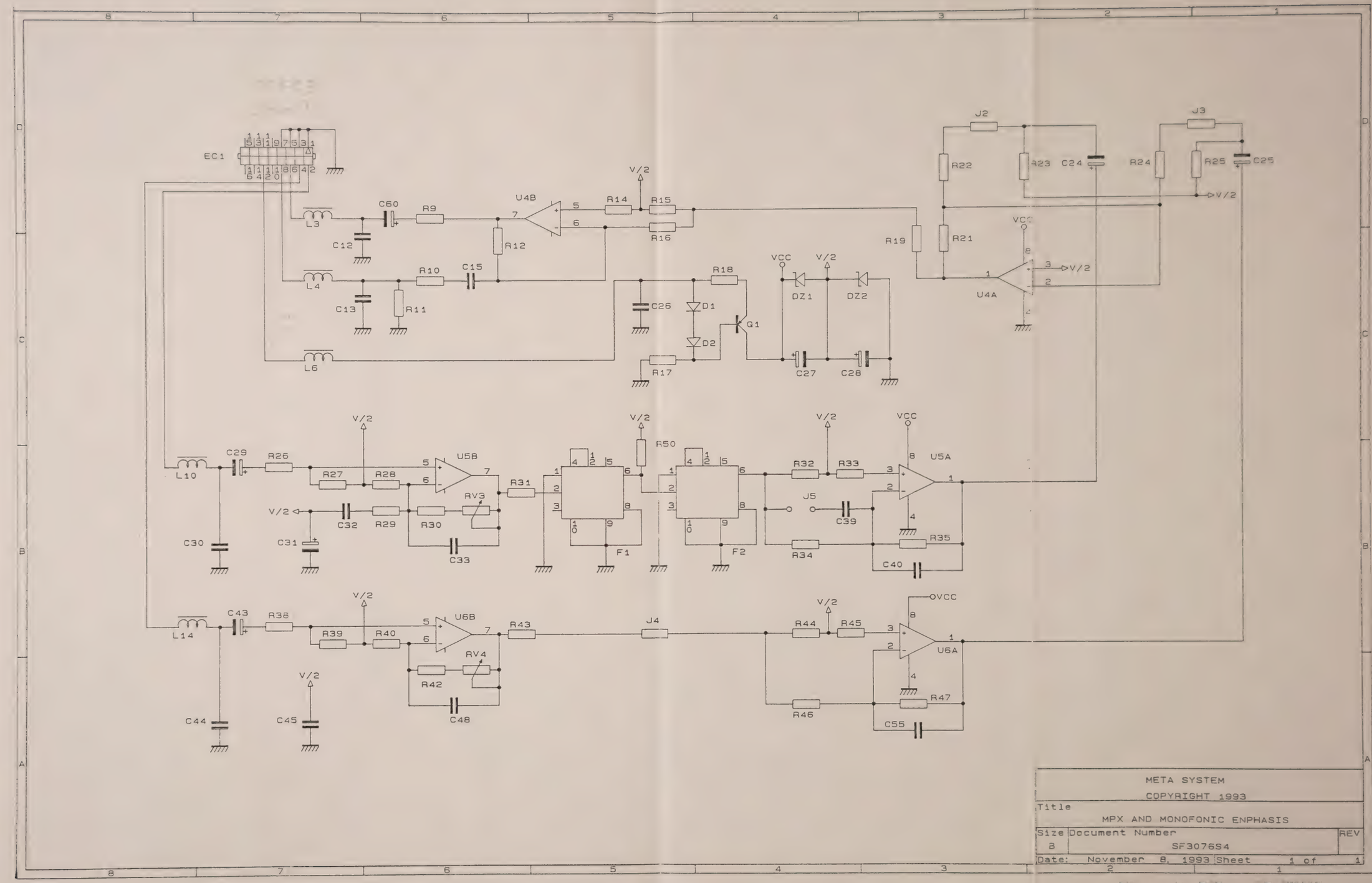

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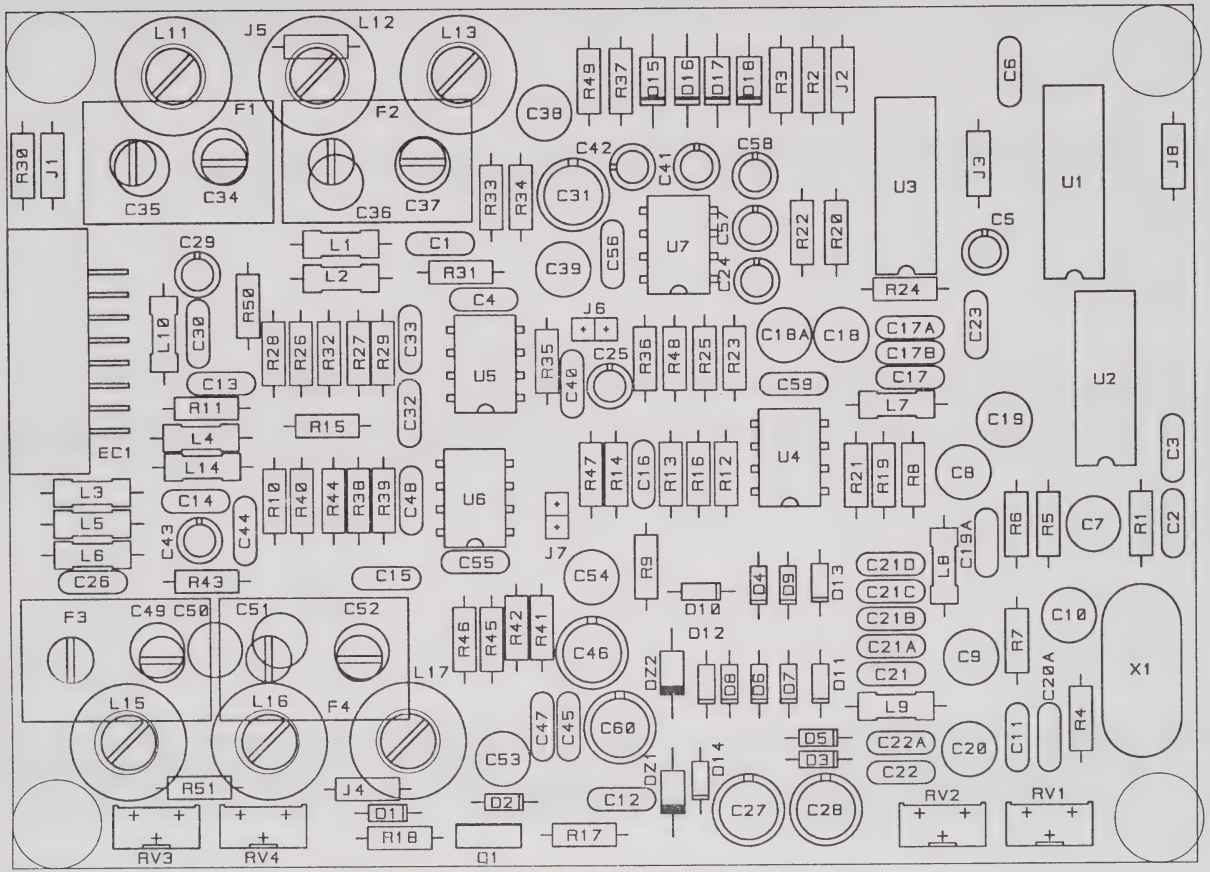
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Q1
RV3
RV4

MPX AND MONOFONIC ENPHASIS

cod. SF3076

Part List

Item	Ref.	Description	Part Number
1	C12	470p	C1347T
2	C13	1n	C1410W
3	C15	10n	C1510W
4	C24	4µ7	C2147J
5	C25	4µ7	C2147J
6	C26	1n	C1410W
7	C27	100µ	C2310D
8	C28	100µ	C2310D
9	C29	4µ7	C2147J
10	C30	1n	C1410W
11	C31	100µ	C2310D
12	C32	100p	C1310D
13	C33	39p	C1239C
14	C39	1n	C9014
15	C40	10p	C1210C
16	C43	4µ7	C2147J
17	C44	1n	C1410W
18	C45	0µ1	C01764
19	C48	39p	C1239C
20	C55	22p	C1222C
21	C60	100µ	C2310D
22	DZ1	7V5	D00107
23	DZ2	7V5	D00107
24	D1	1N4148	D00504
25	D2	1N4148	D00504
26	EC1	POL16	
27	F1	LOW PASS FILTER	M00974
28	F2	LOW PASS FILTER	M00974
29	J2	0	R09000
30	J3	0	R09000
31	J4	0	R09000
32	J5	JUMPER	
34	L3	22µ	M00028
35	L4	22µ	M00028
36	L6	22µ	M00028
37	L10	22µ	M00028
38	L14	22µ	M00028
39	Q1	BD231	T00041
40	RV3	TRIMMER 47K	R0524A
41	RV4	TRIMMER 47K	R0524A
42	R9	100	R00241
43	R10	10K	R00481

Item	Ref.	Description	Part Number
44	R11	56	R00211
45	R12	5K1	R01262
46	R14	1K8	R00391
47	R15	3K65	R01234
48	R16	4K42	R01250
49	R17	6K81	R01286
50	R18	18	R00151
51	R19	1K	R01126
52	R21	40K2	R01434
53	R22	6K81	R01286
54	R23	6K81	R01286
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56	R25	6K81	R01286
57	R26	1K	R01126
58	R27	18K	R00511
59	R28	18K	R00511
60	R29	22K	R01182
61	R30	1K	R01126
62	R31	4K64	R01264
63	R32	5K62	R01270
64	R33	18K	R00511
65	R34	49K9	R01452
66	R35	49K9	R01452
67	R38	1K	R01126
68	R39	18K	R00511
69	R40	18K	R00511
70	R42	1K	R01126
71	R43	1K96	R01182
72	R44	1K96	R01182
73	R45	18K	R00511
74	R46	49K9	R01452
75	R47	27K4	R01402
76	R50	33K	R00541
77	U4A	TL072	I00308
78	U4B	TL072	I00308
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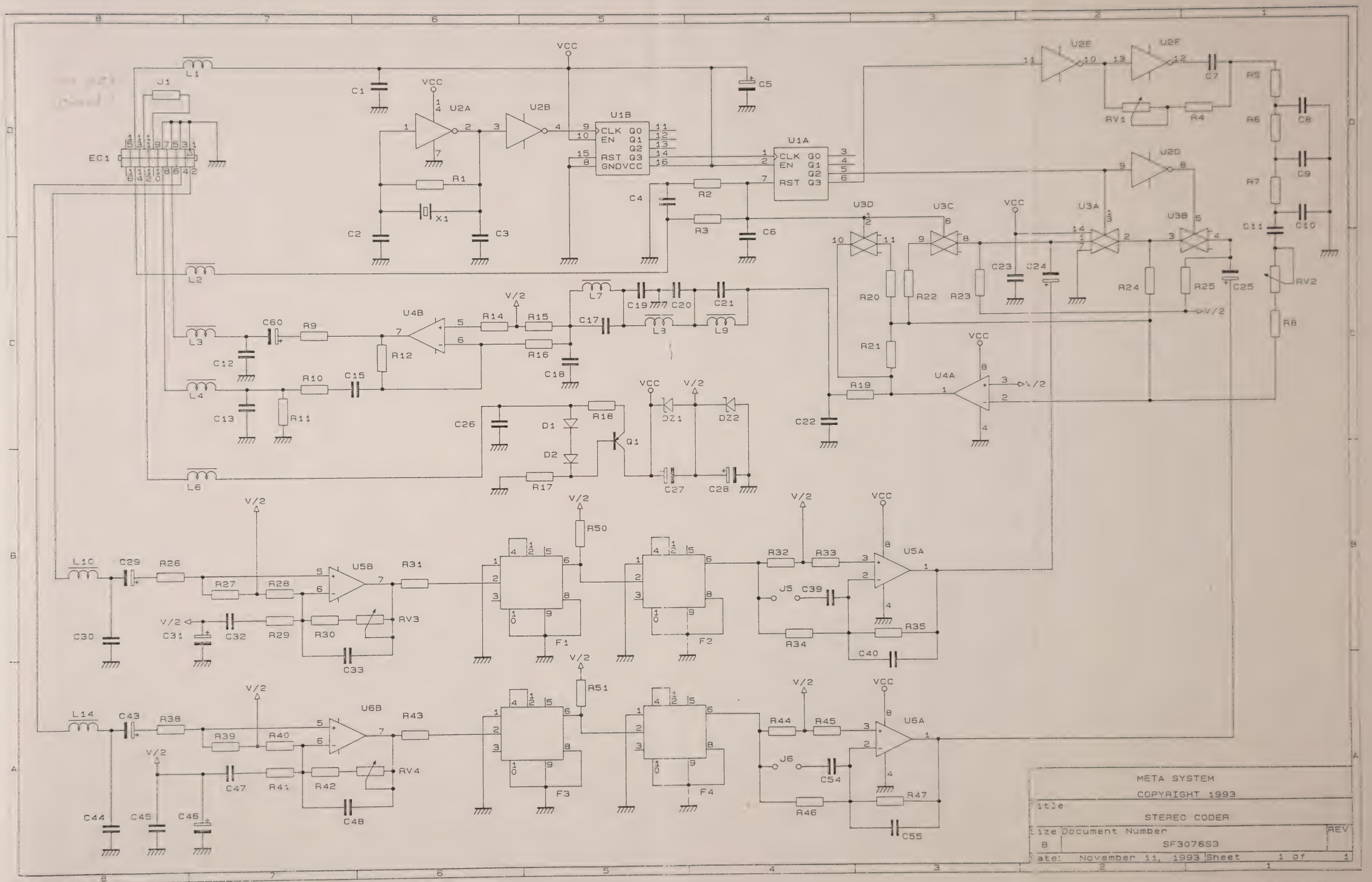
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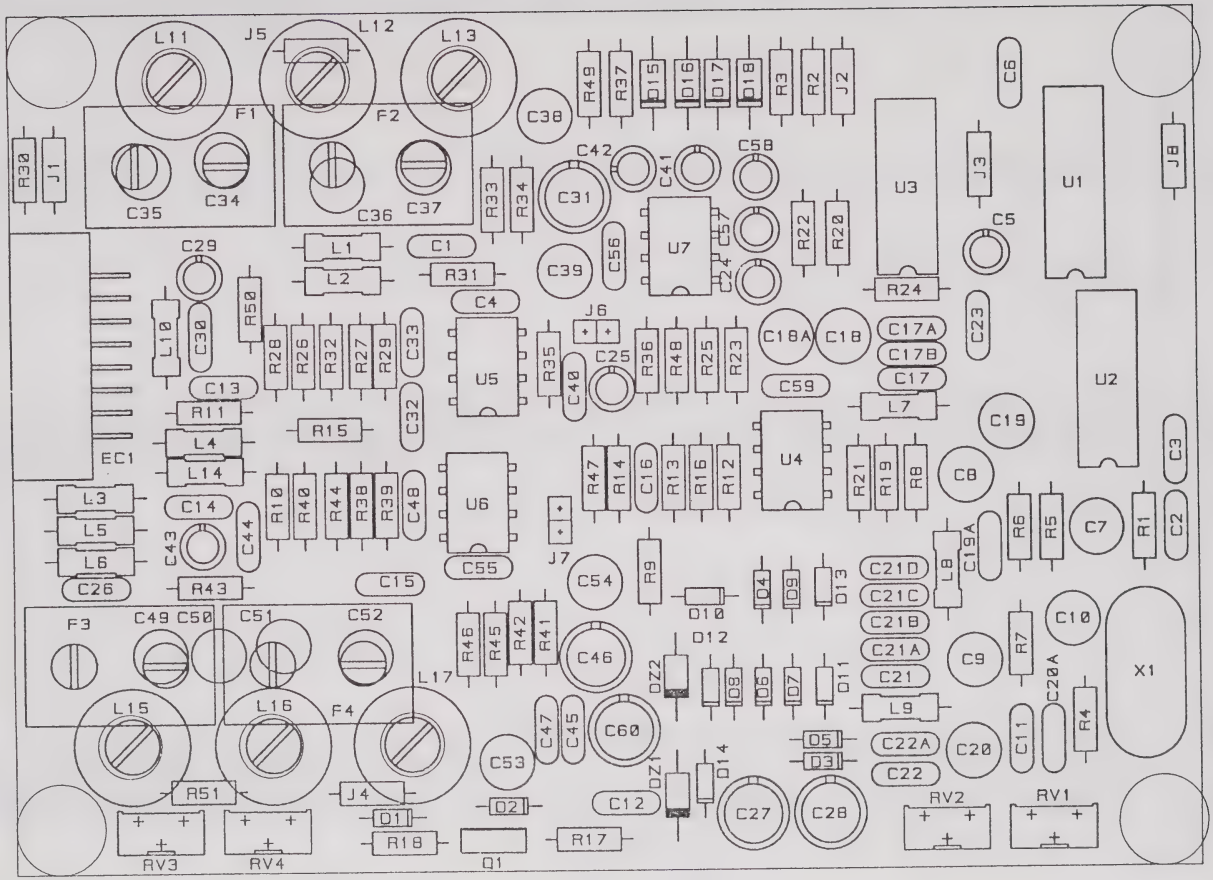
SF3076S3
November 11, 1993
Sheet 1 of 1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RV1
RV3
RV4
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R17

STEREO CODER

cod. SF3076S3

Part List

Item	Ref.	Description	Part Number
1	C1	1n	C1410W
2	C2	47p	C1247C
3	C3	100p	C1310B
4	C4	1n	C1410W
5	C5	10µ	C2210J
6	C6	10n	C1510W
7	C7	2n2	C09018
8	C8	1n	C09014
9	C9	1n	C09014
10	C10	1n	C09014
11	C11	0µ1	C01764
12	C12	470p	C1347T
13	C13	1n	C1410W
14	C15	10n	C1510W
15	C17	720p	2xC1333P + C1268C
16	C18	4n4	2xC09018
17	C19	1.33n	C09014 + C1333P
18	C20	1.33n	C09014 + C1333P
19	C21	1110p	3xC1333P + 2xC1268C
20	C22	660p	2xC1333P
21	C23	0µ1	C01764
22	C24	4µ7	C2147J
23	C25	4µ7	C2147J
24	C26	1n	C1410W
25	C27	100µ	C2310D
26	C28	100µ	C2310D
27	C29	4µ7	C2147J
28	C30	1n	C1410W
29	C31	100µ	C2310D
30	C32	100p	C1310D
31	C33	39p	C1239C
32	C39	1n	C09014
33	C40	10p	C1210C
34	C43	4µ7	C2147J
35	C44	1n	C1410W
36	C45	0µ1	C01764
37	C46	100µ	C2310D
38	C47	100p	C1310D
39	C48	39p	C1239C
40	C54	1n	C09014
41	C55	10p	C1210C
42	C60	100µ	C2310D
43	DZ1	7V5	D00107

Item	Ref.	Description	Part Number
44	DZ2	7V5	D00107
45	D1	1N4148	D00504
46	D2	1N4148	D00504
47	EC1	POL 8X2	E05212
48	F1	LOW PASS FILTER	M00974
49	F2	LOW PASS FILTER	M00974
50	F3	LOW PASS FILTER	M00974
51	F4	LOW PASS FILTER	M00974
52	J1	0	R09000
53	J5	JUMPER	
55	J6	JUMPER	
57	L1	22µ	M00028
58	L2	22µ	M00028
59	L3	22µ	M00028
60	L4	22µ	M00028
61	L6	22µ	M00028
62	L7	2.2mH	M00052
63	L8	2.2mH	M00052
64	L9	2.2mH	M00052
65	L10	22µ	M00028
66	L14	22µ	M00028
67	Q1	BD231	T00041
68	RV1	10K TRIMMER	R0518A
69	RV2	47K TRIMMER	R0524A
70	RV3	47K TRIMMER	R0524A
71	RV4	47K TRIMMER	R0524A
72	R1	1M	R00721
73	R2	6K8	R00461
74	R3	100	R00241
75	R4	3K3	R00421
76	R5	22K1	R01384
77	R6	22K1	R01384
78	R7	22K1	R01384
79	R8	3K3	R00421
80	R9	100	R00241
81	R10	10K	R00481
82	R11	56	R00211
83	R12	5K1	R01262
84	R14	1K8	R00391
85	R15	3K65	R01234
86	R16	4K42	R01250
87	R17	6K81	R01286
88	R18	18	R00151
89	R19	1K	R01126
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91	R21	18K2	R01368
92	R22	6K81	R01286

Item	Ref.	Description	Part Number
93	R23	6K81	R01286
94	R24	6K81	R01286
95	R25	6K81	R01286
96	R26	1K	R01126
97	R27	18K	R00511
98	R28	18K	R00511
99	R29	22K	R01182
100	R30	1K	R01126
101	R31	4K64	R01254
102	R32	5K62	R01270
103	R33	18K	R00511
104	R34	49K9	R01452
105	R35	49K9	R01452
106	R38	1K	R01126
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117	R51	33K	R00541
118	U1A	4520B	T00078
119	U1B	4520B	T00078
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121	U2B	4069B	I00047
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123	U2E	4069B	I00047
124	U2F	4069B	I00047
125	U3A	4066B	I00046
126	U3B	4066B	I00046
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128	U3D	4066B	I00046
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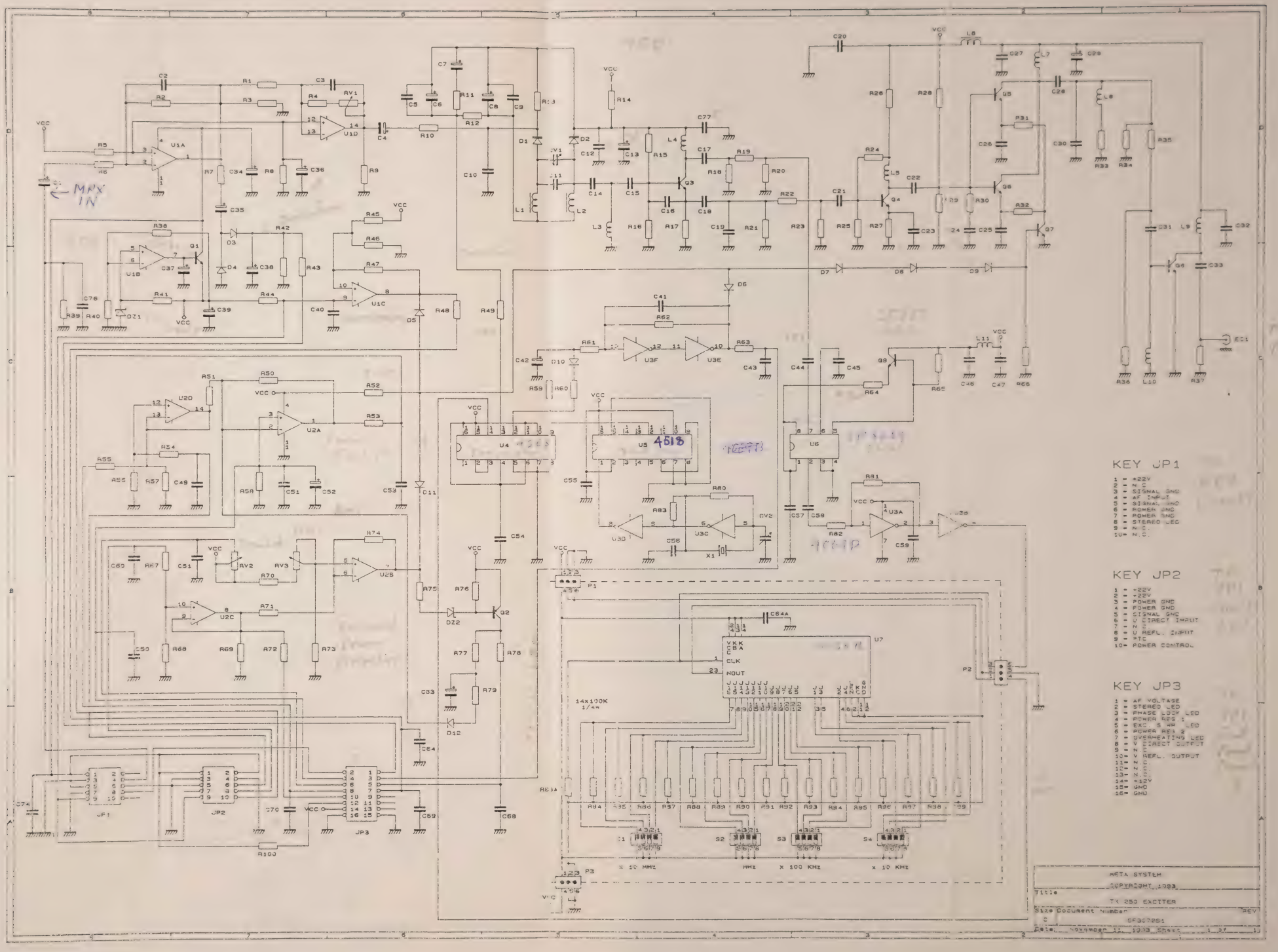
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8 = STEREO LED
9 = N.C.
10= N.C.
KEY JP2
1 = +22V
2 = +22V
3 = POWER GND
4 = POWER GND
5 = SIGNAL GND
6 = V DIRECT INPUT
7 = N.C.
8 = V REFL. INPUT
9 = PTC
10= POWER CONTROL
KEY JP3
1 = AF VOLTAGE
2 = STEREO LED
3 = PHASE LOCK LED
4 = POWER REG.1
5 = EXC. 5 MH. LED
6 = POWER REG.2
7 = OVERHEATING LED
8 = V DIRECT OUTPUT
9 = N.C.
10= V REFL. OUTPUT
11= N.C.
12= N.C.
13= N.C.
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META SYSTEM
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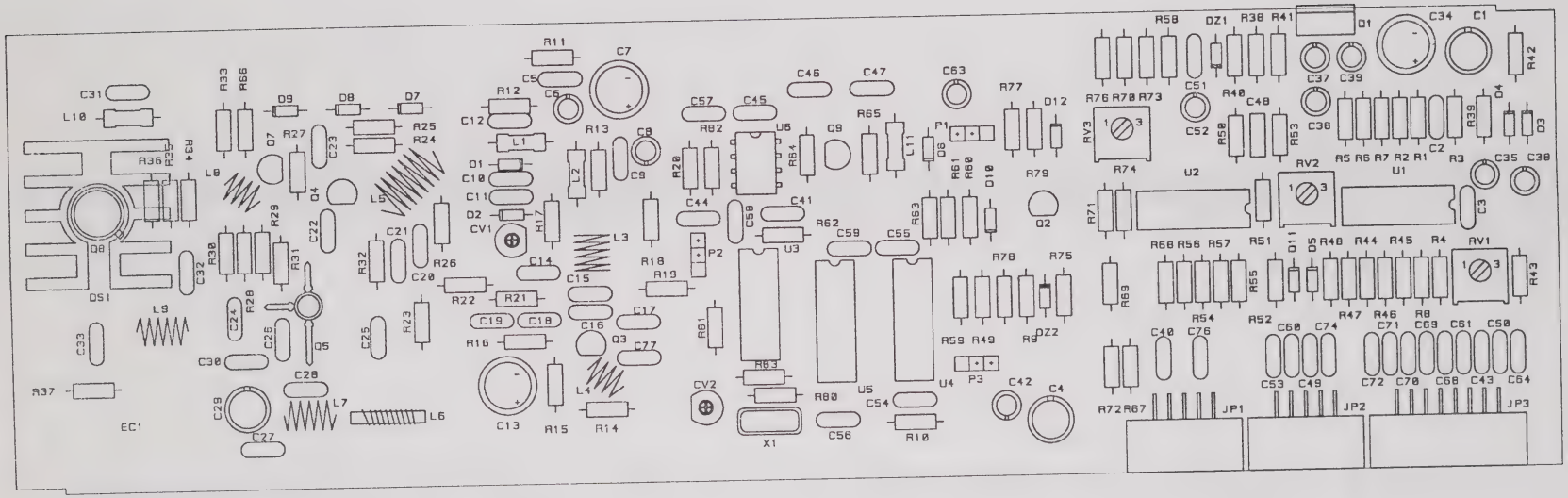
Size Document Number
Date: November 12, 1993 Sheet 1 of 1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TX 250 EXCITER

cod. SF3072

Part List

Item	Ref.	Description	Part Number
1	CV1	20p	C05036
2	CV2	60p	C05031
3	C1	100µ	C2310D
4	C2	2p2	C1122C
5	C3	2p2	C1122C
6	C4	100µ	C2310D
7	C5	0µ1	C01764
8	C6	10µ	C2210J
9	C7	47µ	C00143
10	C8	10µ	C2210J
11	C9	0µ1	C01764
12	C10	220p	C1322P
13	C11	47p	C1247C
14	C12	47n	C1547W
15	C13	470µ	C2347D
16	C14	270p	C1327N
17	C15	10p	C1210C
18	C16	22p	C1222C
19	C17	33p	C1233C
20	C18	47p	C1247C
21	C19	68	C1268C
22	C20	47n	C1547W
23	C21	150p	C1315P
24	C22	150p	C1315P
25	C23	150p	C1315P
26	C24	4p7	C1147P
27	C25	82p	C1282C
28	C26	82p	C1282C
29	C27	47n	C1547W
30	C28	150p	C1315P
31	C29	100µ	C2310D
32	C30	10p	C1210C
33	C31	220p	C1322P
34	C32	47n	C1547W
35	C33	220p	C1322P
36	C34	100µ 50V	C2310J
37	C35	10µ	C2210J
38	C36	10µ	C2210J
39	C37	10µ	C2210J
40	C38	10µ	C2210J
41	C39	10µ	C2210J
42	C40	47n	C1547W
43	C41	120p	C1312D

Item	Ref.	Description	Part Number
44	C42	10µ	C2210J
45	C43	47n	C1547W
46	C44	10n	C1510W
47	C45	10n	C1510W
48	C46	0µ1	C01764
49	C47	0µ1	C01764
50	C49	1n	C1410J
51	C50	1n	C1410J
52	C51	1n	C1410J
53	C52	10µ	C2210J
54	C53	1n	C1410J
55	C54	47n	C1547W
56	C55	47n	C1547W
57	C56	68p	C1268C
58	C57	10n	C1510W
59	C58	10n	C1510W
60	C59	47n	C1547W
61	C60	1n	C1410J
62	C61	1n	C1410J
63	C63	10µ	C2210J
64	C64	1n	C1410J
65	C64A	47n	C1547W
66	C68	1n	C1410J
67	C69	1n	C1410J
68	C70	1n	C1410J
69	C74	1n	C1410J
70	C76	1n	C1410J
71	C77	1n	C1410J
72	DZ1	6V8	D00100
73	DZ2	7V5 1/4W	D00105
74	D1	BB809	D00615
75	D2	BB809	D00615
76	D3	AA119	D00800
77	D4	AA119	D00800
78	D5	1N4148	D00504
79	D6	1N4148	D00504
80	D7	1N4148	D00504
81	D8	1N4148	D00504
82	D9	1N4148	D00504
83	D10	1N4148	D00504
84	D11	1N4148	D00504
85	D12	1N4148	D00504
86	EC1	BNC	E04541
87	JP1	HEADER 5X2	E05610
88	JP2	HEADER 5X2	E05610
89	JP3	HEADER 8X2	E05612
90	L1	0.82µH	M00011
91	L2	0.82µH	M00011
92	L3		M03083

Item	Ref.	Description	Part Number
93	L4		M03104
94	L5		M03104
95	L6	3.3µH	M00160
96	L7		M03184
97	L8		M03104
98	L9		M03184
99	L10	6.8µH	M00022
100	L11	68µH	M00034
101	P1	POLISTRIP	E04302
102	P2	POLISTRIP	E04302
103	P3	POLISTRIP	E04302
104	Q1	TIP31	T00300
105	Q2	BC307	T00599
106	Q3	2N5770	T00965
107	Q4	MPS918	T00903
108	Q5	BFR96	T00870
109	Q6	BFR96	T00870
110	Q7	BC337	T00550
111	Q8	2N4427	T00955
112	Q9	BC337	T00550
113	RV1	10K TRIMMER	R0518
114	RV2	50K TRIMMER	R0522
115	RV3	50K TRIMMER	R0522
116	R1	12K	R00491
117	R2	22K	R00521
118	R3	2K7	R00411
119	R4	3K3	R00421
120	R5	33K	R00541
121	R6	22K	R00521
122	R7	3K3	R00421
123	R8	33K	R00541
124	R9	4K7	R00441
125	R10	4K7	R00441
126	R11	2K7	R00411
127	R12	2K2	R00401
128	R13	330	R00301
129	R14	22	R00161
130	R15	10K	R00481
131	R16	18K	R00511
132	R17	680	R00341
133	R18	100	R00241
134	R19	82	R00231
135	R20	100	R00241
136	R21	100	R00241
137	R22	82	R00231
138	R23	100	R00241
139	R24	15K	R00501
140	R25	4K7	R00441
141	R26	47	R00201

Item	Ref.	Description	Part Number
142	R27	470	R00321
143	R28	3K3	R00421
144	R29	4K7	R00441
145	R30	100	R00241
146	R31	47	R00201
147	R32	47	R00201
148	R33	39	R00191
149	R34	330	R00301
150	R35	39	R00191
151	R36	270	R00291
152	R37	330	R00301
153	R38	5K6	R00451
154	R39	220K	R00641
155	R40	6K8	R00461
156	R41	2K2	R00401
157	R42	47K	R00561
158	R43	4K7	R00441
159	R44	4K7	R00441
160	R45	10K	R00481
161	R46	10K	R00481
162	R47	470K	R00681
163	R48	10K	R00481
164	R49	5K6	R00451
165	R50	220K	R00641
166	R51	100K	R00601
167	R52	4K7	R00441
168	R53	4K7	R00441
169	R54	10K	R00481
170	R55	10K	R00481
171	R56	4K7	R00441
172	R57	10K	R00481
173	R58	18K	R00511
174	R59	22K	R00521
175	R60	1K8	R00391
176	R61	220K	R00641
177	R62	2M2	R00761
178	R63	1K	R00361
179	R64	8.2	R00111
180	R65	1K5	R00381
181	R66	2K2	R00401
182	R67	10K	R00481
183	R68	10K	R00481
184	R69	10K	R00481
185	R70	47K	R00561
186	R71	100K	R00601
187	R72	2K2	R00401
188	R73	10K	R00481
189	R74	1M	R00721
190	R75	3K3	R00421

Item	Ref.	Description	Part Number
191	R76	2K2	R00401
192	R77	22K	R00521
193	R78	470	R00321
194	R79	33K	R00541
195	R80	1M	R00721
196	R81	1M	R00721
197	R82	220	R00281
198	R83	470	R00321
199	R83A	100K 1/4W	R00601
200	R84	100K 1/4W	R00601
201	R85	100K 1/4W	R00601
202	R86	100K 1/4W	R00601
203	R87	100K 1/4W	R00601
204	R88	100K 1/4W	R00601
205	R89	100K 1/4W	R00601
206	R90	100K 1/4W	R00601
207	R91	100K 1/4W	R00601
208	R92	100K 1/4W	R00601
209	R93	100K 1/4W	R00601
210	R94	100K 1/4W	R00601
211	R95	100K 1/4W	R00601
212	R96	100K 1/4W	R00601
213	R97	100K 1/4W	R00601
214	R98	100K 1/4W	R00601
215	R99	100K 1/4W	R00601
216	R100	22K	R00521
217	S1	DIP4	E01066
218	S2	DIP4	E01066
219	S3	DIP4	E01066
220	S4	DIP4	E01066
221	U1A	TL084	I00310
222	U1B	TL084	I00310
223	U1C	TL084	I00310
224	U1D	TL084	I00310
225	U2A	MC3403	I00303
226	U2B	MC3403	I00303
227	U2C	MC3403	I00303
228	U2D	MC3403	I00303
229	U3A	4069B	I00047
230	U3B	4069B	I00047
231	U3C	4069B	I00047
232	U3D	4069B	I00047
233	U3E	4069B	I00047
234	U3F	4069B	I00047
235	U4	4568	I00088
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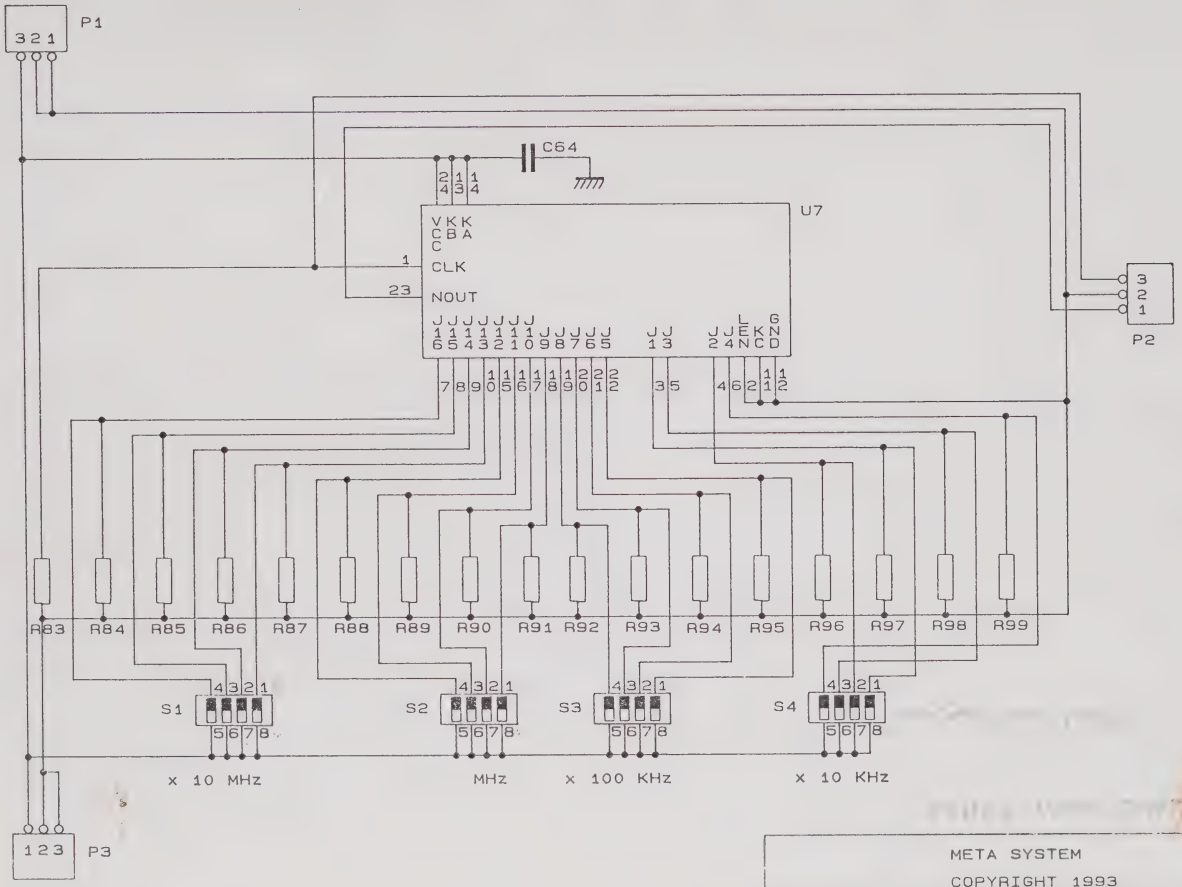
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C64
U7
CLK
NOUT
P2
R83 R84 R85 R86 R87 R88 R89 R90 R91 R92 R93 R94 R95 R96 R97 R98 R99
S1
S2
S3
S4
x 10 MHz
MHz
x 100 KHz
x 10 KHz
P3
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Title
FREQUENCY SELECTOR
Size
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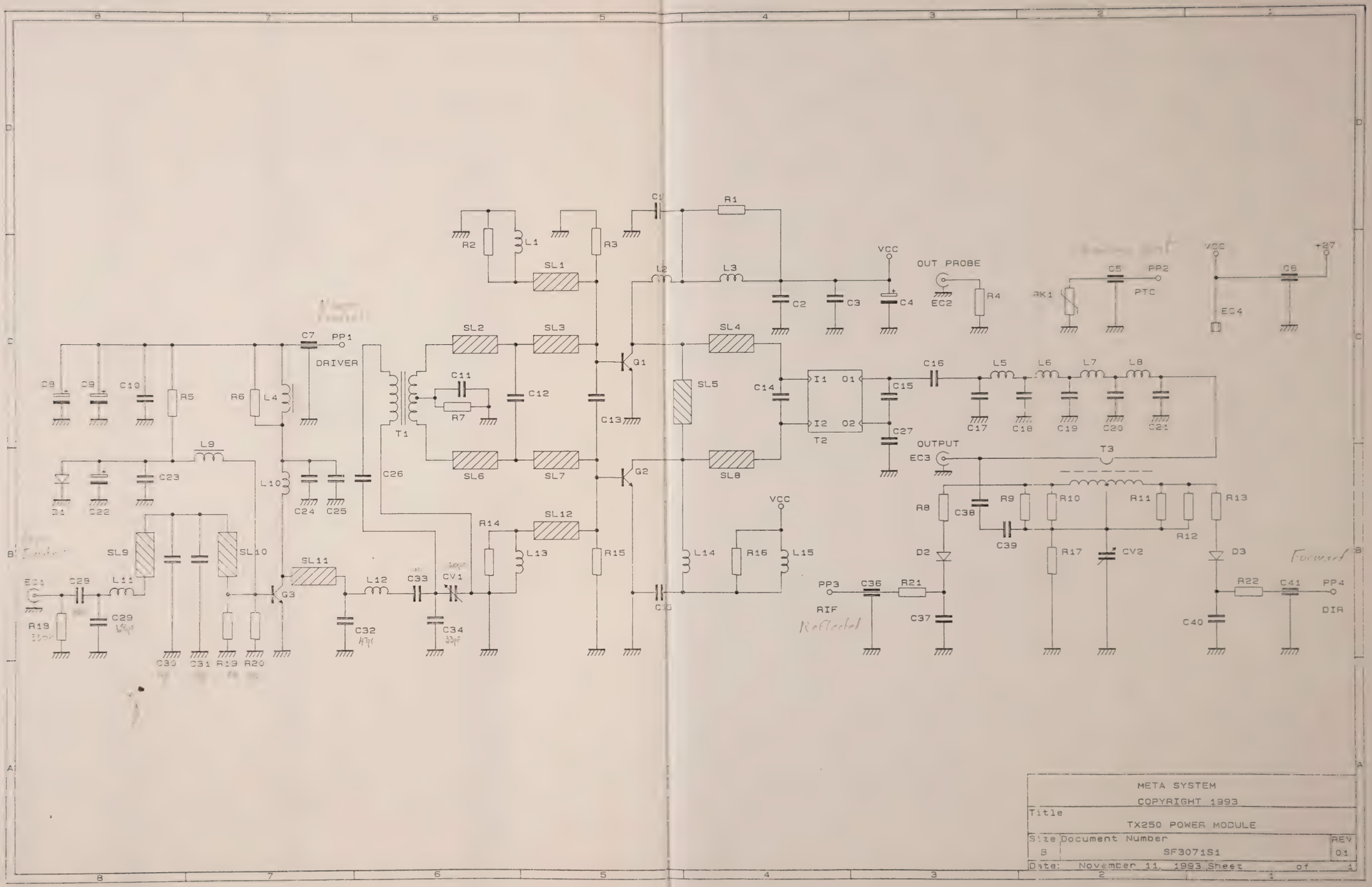
Document Number
SF3073S1
REV
Date: November 12, 1993
Sheet 1 of 1



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Title: TX250 POWER MODULE		
Size: B	Document Number: SF3071S1	REV: 01
Date: November 11, 1993	Sheet of	1

TX250 POWER MODULE

cod. SF3071

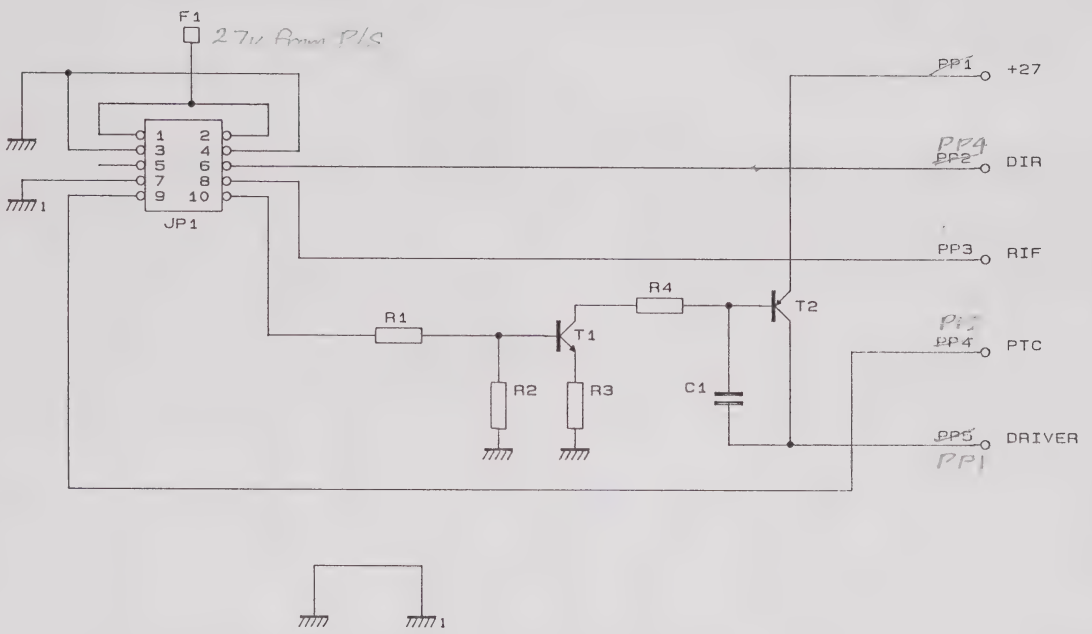
Part List

Item	Ref.	Description	Part Number
1	CV1	60p	C05030
2	CV2	60p	C05030
3	C1	2x680p	C1368Ux2
4	C2	10n	C1510W
5	C3	100n	C1610W
6	C4	4µ7 50V	C2147N
7	C5	1n	C06070
8	C6	1n	C06070
9	C7	1n	C06070
10	C8	1000µ 63V	C2410H
11	C9	4µ7	C2147N
12	C10	0µ1	C01764
13	C11	180p	C1318P
14	C12	120p	C1312F
15	C13	47p+470p GR111	C1247F+C02144
16	C14	68px2+15px2	C07090x2+C08356x2
17	C15	4p7	C08332
18	C16	1n GR111	C02160
19	C17	33p	C07074
20	C18	68p	C07090
21	C19	68p	C07090
22	C20	68p	C07090
23	C21	33p	C07074
24	C22	47 25V	C2247D
25	C23	47n	C1547W
26	C24	470p	C1347N
27	C25	470p	C1347N
28	C26	33p	C1233F
29	C27	1n GR111	C0260
30	C28	82p	C1282F
31	C29	68p	C07090
32	C30	120p	C1312D
33	C31	120p	C1312D
34	C32	47p	C1247C
35	C33	1n	C1410T
36	C34	33p	C1233F
37	C35	2x680p	C1368Ux2
38	C36	1n	C06070
39	C37	1n	C1410T
40	C38	4p7	C08332
41	C39	4p7	C08332
42	C40	1n	C1410T
43	C41	1n	C06070

Item	Ref.	Description	Part Number
44	D1	1N4002	D00511
45	D2	1N6263	D00807
46	D3	1N6263	D00807
47	EC1	BNC	E04541
48	EC2	BNC	E04541
49	EC3	BNC	E04541
50	EC4	FF	V06502
51	L1	VK200	M00160
52	L2		M03085
53	L3		M03166
54	L4	VK200	M00160
55	L5	COIL	
56	L6	COIL	
57	L7	COIL	
58	L8	COIL	
59	L9	VK200	M00160
60	L10	COIL	
61	L11	COIL	
62	L12	COIL	
63	L13	VK200	M00160
64	L14		M03085
65	L15		M03166
66	PP1	PINS	
67	PP2	PINS	
68	PP3	PINS	
69	PP4	PINS	
70	Q1	BLV25	T01005
71	Q2	BLV25	T01005
72	Q3	BLY93C	T01035
73	RK1	PTCF	R10205
74	R1	10 1W	R04072
75	R2	5.6 1/2W	R09030
76	R3	27 3W	R04104
77	R4	47	R00201
78	R5	330 5W	R03427
79	R6	12 2W	R04079
80	R7	15 1/2W	R09031
81	R8	47	R00201
82	R9	100	R00241
83	R10	100	R00241
84	R11	100	R00241
85	R12	100	R00241
86	R13	47	R00201
87	R14	5 6 1/2W	R09030
88	R15	27 3W	R04104
89	R16	10 1W	R04072
90	R17	1K	R00361
91	R18	330 1/2W	R00302
92	R19	10	R00121

Item	Ref.	Description	Part Number
93	R20	10	R00121
94	R21	470	R00321
95	R22	470	R00321
96	SL1	STRIP	
97	SL2	STRIP	
98	SL3	STRIP	
99	SL4	STRIP	
100	SL5	STRIP	
101	SL6	STRIP	
102	SL7	STRIP	
103	SL8	STRIP	
104	SL9	STRIP	
105	SL10	STRIP	
106	SL11	STRIP	
107	SL12	STRIP	
108	T1	TRASF	XF7L11
109	T2	TRAN	XF9C01
110	T3	TRAN2	M01088

TO JP2
Circuit 4



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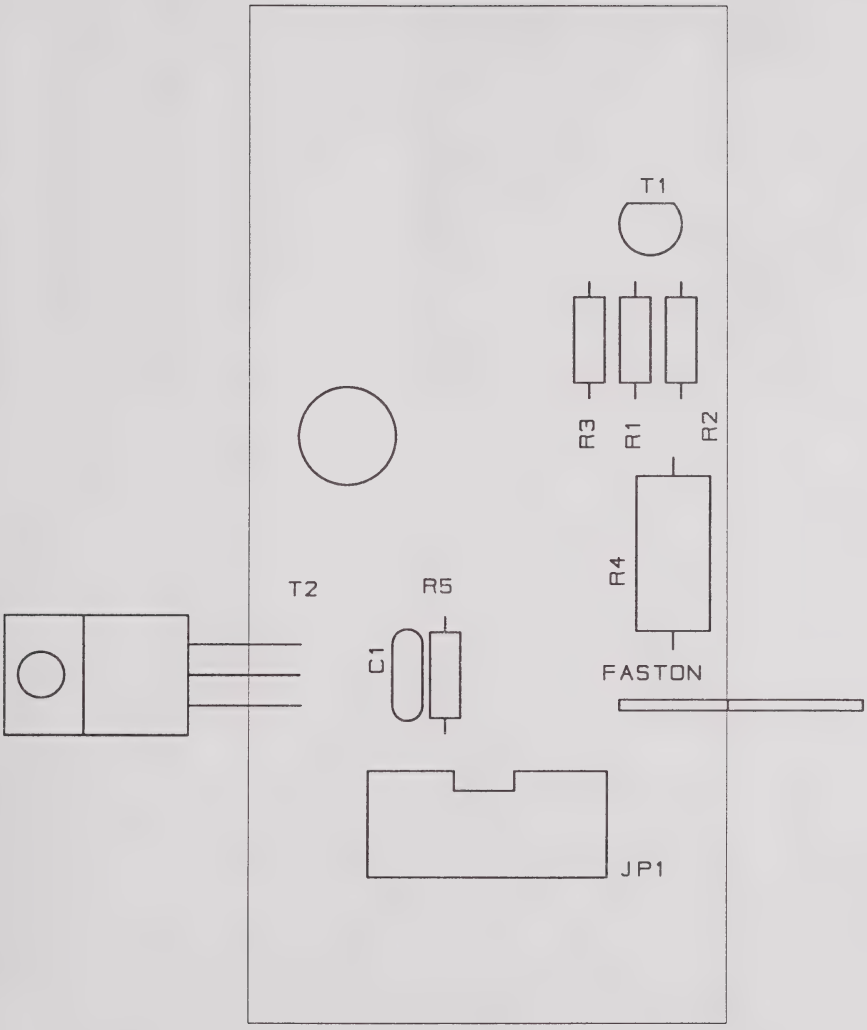
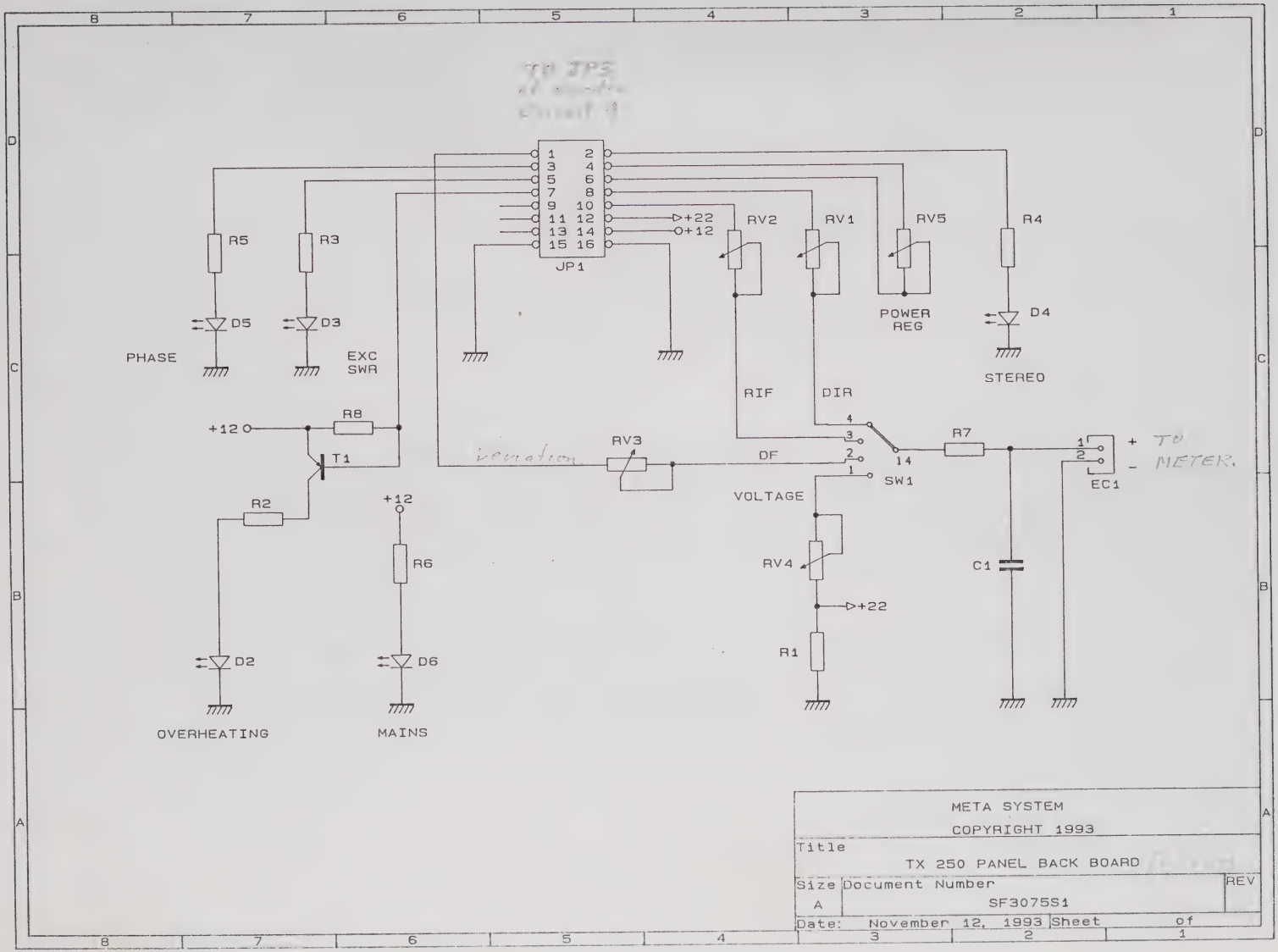

T1
R3
R1
R2
R4
T2
R5
C1
FASTON
JP1

POWER CONTROLER

cod. SF3074

Part List

Item	Ref.	Description	Part Number
1	C1	1n	C01717
2	F1	FASTON MASCHIO	E04242
3	JP1	DUPONT 5X2	E05600
4	PP1	PINS	
5	PP2	PINS	
6	PP3	PINS	
7	PP4	PINS	
8	PP5	PINS	
9	R1	4K7	R00441
10	R2	1K	R00361
11	R3	1K	R00361
12	R4	1K8 1W	R04234
13	T1	BC337	T00550
14	T2	BDW94	T00173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+22
+12
RV2
RV1
RV5
R4
R5
R3
D5
D3
D4
PHASE
EXC SWR
POWER REG
STEREO
RIF
DIR
R8
+12
T1
RV3
DF
R7
SW1
EC1
+ TO METER
-
R2
+12
R6
VOLTAGE
RV4
C1
+22
R1
D2
D6
OVERHEATING
MAINS
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TX 250 PANEL BACK BOARD
Size
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REV
Date: November 12, 1993
Sheet
of

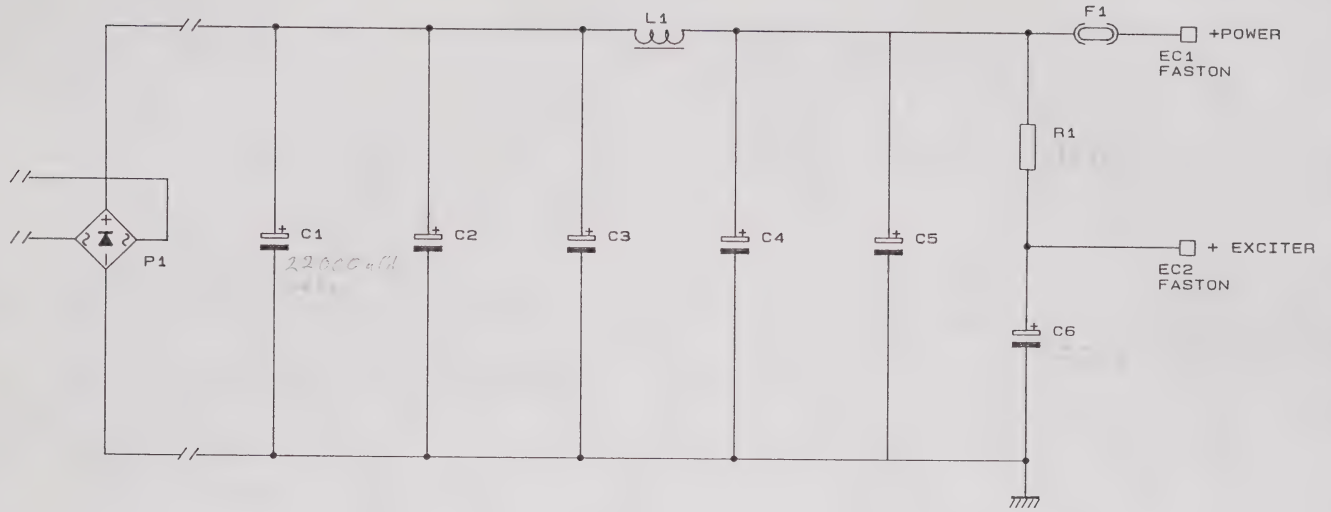
RV1
RV2
RV3
RV4
SW1
JP1
D6
D5
D4
D3
D2
EC1
R7
C1
RV5
1
3
R6
R5
R4
R3
R2
T1
R8
R1

TX 250 PANEL BACK BOARD

cod. SF3075

Part List

Item	Ref.	Description	Part Number
1	C1	0µ1	C01764
2	D2	RED LED	A00040
3	D3	RED LED	A00040
4	D4	YELLOW LED	A00020
5	D5	GREEN LED	A00000
6	D6	GREEN LED	A00000
7	EC1	METER	E07009
8	JP1	HEADER 8X2	E05612
9	RV1	50K V	R0522A
10	RV2	50K V	R0522A
11	RV3	50K V	R0522A
12	RV4	50K V	R0522A
13	RV5	50K O	R0522A
14	R1	2K2	R00401
15	R2	470	R00321
16	R3	470	R00321
17	R4	470	R00321
18	R5	470	R00321
19	R6	1K	R00361
20	R7	10K	R00481
21	R8	3K3	R00421
22	SW1	1V4P	E3006
23	T1	BC327	T00540



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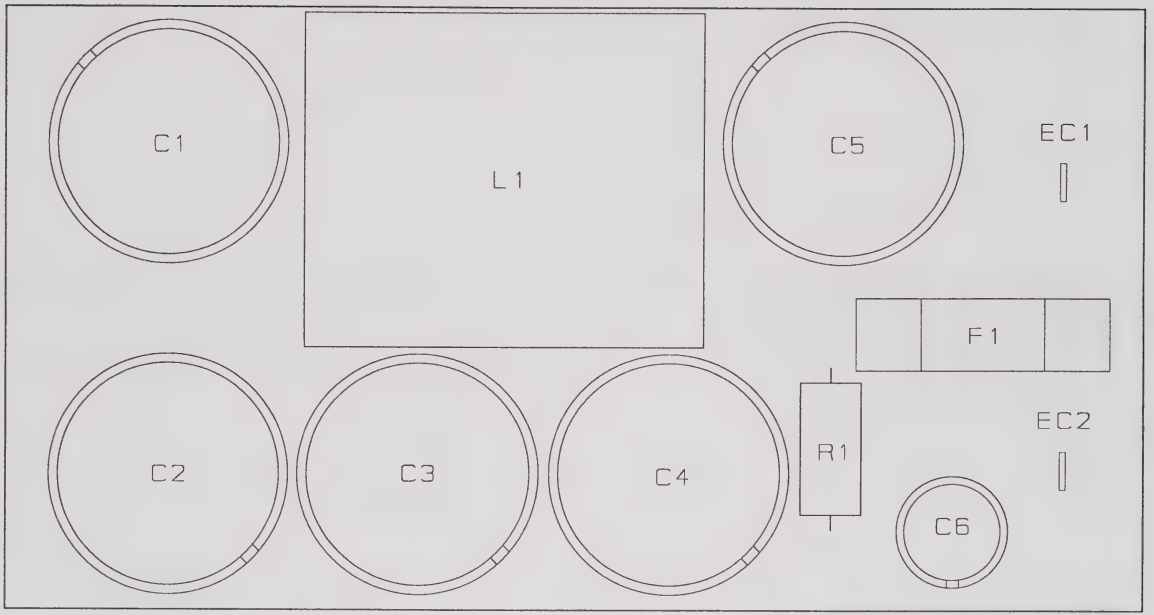

C1
L1
C5
EC1
F1
C2
C3
C4
R1
EC2
C6

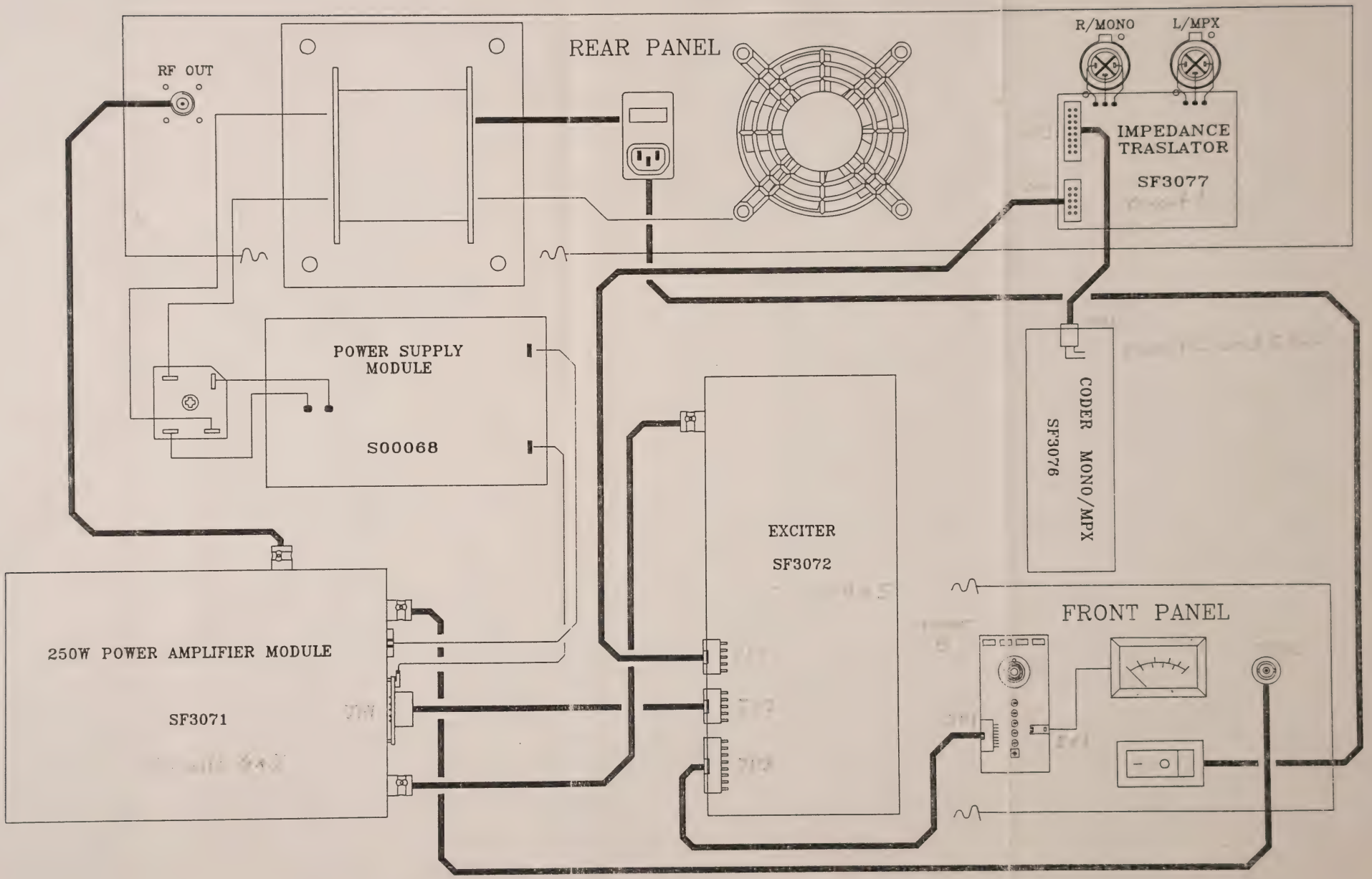
TX 250 POWER SUPPLY

cod. SF3092

Part List

Item	Ref.	Description	Part Number
1	C1	22000µ 40V	C2522G
2	C2	22000µ 40V	C2522G
3	C3	22000µ 40V	C2522G
4	C4	22000µ 40V	C2522G
5	C5	22000µ 40V	C2522G
6	C6	2200µ 50V	C2422G
7	EC1	FASTON	E04241
8	EC2	FASTON	E04241
9	F1	20A	V0767F
10	L1	FILTER CHOKE	M00976
11	P1	RECTIFIER BRIDGE, 35A	D00916
12	R1	12 5W	R03222

INTERCONNECTIONS DIAGRAM



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